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F. B. WEBSTER, Editor
H. H. BROWN, Managing Editor
L. S. BLODGETT, Associate Editor W. Z. GARDNER, News Editor

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A Great Loss

THE people of these United States have suffered a great loss in the untimely death of President Harding. All classes of men and women in every industry have felt and expressed this loss with genuine sorrow but none more than those who build and operate ships.

Our President was the greatest friend of the merchant marine. It was his dearest wish that American shipping should be developed and firmly established during his administration on a basis adequate to serve our commercial and naval needs. If he had received the support in Congress that he should have had from his own party, his ambition would now be well on its way to fulfilment.

There is nothing that we can do that would please our departed leader more or do him greater honor than to carry out his wishes in this respect. He never wavered in his determination to secure such legislation as would encourage private interests to embark on shipping ventures. Let us, therefore, "gird up our loins" and fight with renewed vigor so that President Harding's name may be perpetuated as the father of the American merchant marine.

An Imperative Demand

THE Chamber of Commerce of the United States, commercial, manufacturing and business organizations and every man in the street who believes in the principles upon which this country has become great demand that Government operation whether it be of ships, railroads, mines or bureaucracy in general should and ought to be avoided except as a last extremity in great emergencies.

The Shipping Board has alarmed the entire business world with its plan of direct operation. At this writing the board itself has split on the exact method it proposes to adopt. Four of the commissioners favor the creation of eighteen subsidiary companies of the Emergency Fleet Corporation and three commissioners favor centralized direct operation of the entire fleet.

Referring to the plan for eighteen subsidiary corporations, we have already pointed out in a recent editorial that such a method could only result in multiplying the losses that the Government is now sustaining. Again, even if the efficient heads of the present operating companies could be induced to accept the positions of presidents of these corporations, everyone familiar with political procedure would know that their resignations would have to be handed in upon acceptance of their jobs. Then just as soon as they got their particular corporation going at all straight some politician would have a friend who he thought ought to have their job and out they would go.

As to the direct operation of the fleet as a whole, the only comment that we wish to make is that we do not believe that the most efficient business organization in existence could take over such a stupendous proposition and make a success of it.

The Shipping Board was created to devise ways and means of rendering Government assistance to the merchant marine. Why is it worrying and spending its entire time over a form of contract which at least is creating experienced shipping executives? Everyone knows that some form of Government aid is necessary in order to interest private capital in shipping. Why are they not devoting their time to this, the major factor, and to the revision and codification of our navigation laws?

We cannot believe that President Coolidge will sanction Government operation in view of the obvious opposition of all commercial interests and also with the knowledge that such a policy has been condemned more than once by the late President Harding. It is gratifying that the board postponed action until the shipowners and operators presented

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their case on August 28 and we trust that, if it is not convinced of the danger of its proposed course by this conference, it will at least delay action until the representatives of all classes of industry from the entire country voice their sentiments at the American Marine Congress to be held in New York during the week of November 5-10.

The Philippine Mandate

SECTION 21 of the Merchant Marine Act of 1920 relating to the extension of our coastwise laws to include the Philippine Islands still remains inoperative. Not only has Congress directed in this section that after February 1, 1922, the coastwise laws shall extend to the Philippines and all other possessions of the United States not then covered thereby, but it has also directed that the Shipping Board before the expiration of that year should see to it that adequate steamship services at reasonable rates were established.

There can be no loophole for the evasion of the enforcement of Section 21 except that of the lack of shipping facilities to handle the passenger and freight business between the Philippines and the United States. And, in this connection, even if there were any doubt about the language of Section 21, the board has only to turn to Section 7. This section also specifically directs that the board "investigate and determine as promptly as possible after the enactment of this Act what steamship lines should be established and put in operation from ports in the United States, any Territory, District or possession to such world and domestic markets as in its judgment are desirable for promotion, development, and expansion of the foreign and coastwise trade of the United States."

It is known that President Harding on several occasions had considered putting this section into effect. Has the board with all its surplus tonnage neglected to provide adequate shipping facilities and, if so, why? Mr. Vincente Villamin, Philippine expert, recently stated that there were 1,272,780 tons of shipping engaged in the Philippine trade, of which 448,971 tons were British and 405,273 tons American. Is this trade carried in foreign vessels not desirable for American ships or is there some reason more potent than the laws on our statute books that prevents the proper development of our merchant marine?

We believe that we have not far to look for such a reason. Is it not the influence of shippers and exporters both in this country and the Philippines who may fear that the confinement of this trade to American vessels would increase the freight rates? That such would not be the case may be seen from a comparison of the rates charged including both east and west bound voyages between New York and San Francisco. The distance between these ports is approximately the same as the distance from San Francisco to Manila.

From figures obtained from Mr. R. T. Merrill, director of the Bureau of Research of the Shipping Board, the average freight rates for five months on the vessels of the Nawsco line between New York and San Francisco were $8.37 as compared with an average freight rate of $7.17 to the Orient. Thus it will be seen that there is very little difference between American vessels and the vessels of other nations. It should be added that Panama Canal tolls were deducted from the coastwise figures to make the comparison fair.

No one can doubt the wisdom of the coastwise laws as they are now applied. They have caused a phenomenal growth in American shipping plying between our Atlantic and Pacific seaports. The same would be true in regard to the Philippines and, still further, it would be of great advantage to our commercial development and to the creation of an adequate auxiliary Naval Reserve.

Awakening Public Interest in American Shipping

IN an article widely published throughout the United States through the Hearst Newspaper Feature Syndicate and the subject of extensive editorial comment Colonel E. A. Simmons, president of the American Marine Association, states that the passenger business being given American flag ships is such as to fill to capacity the greater number of those in service and that a much heavier percentage of travelers use American steamers than foreign steamers, as gaged by the carrying capacities of the respective lines engaged in trade.

"My investigation shows that the favor of travel has been turned to American ships," says Colonel Simmons, "solely because of the service that is being given and not for any patriotic reason. . . . Eventually, I believe that the support which is now being so generously given our passenger ships will bring about on the part of American people a desire that our freight or cargo ships be given such patronage as will make them the talk of the seas, as our passenger ships have already become."

It is the bringing of such first hand information directly to the majority of the American people that will arouse public support of our ships and stimulate patronage not only for American passenger vessels but also for American cargo ships. As pointed out by James A. Farrell, president of the United States Steel Corporation, in speaking before the National Trade Council at New Orleans: "The greatest subsidy our ships could have in the overseas trade would be the support of the American people."

The Marine Exposition

THE annual Marine Exposition, which will be held during the week of November 5-10 at the Grand Central Palace, New York city, will have a decided influence on the delegates from the commercial, manufacturing and farming organizations who will attend the American Marine Congress that will occur during the same week.

It is very gratifying and encouraging to note the interest that the large number of organizations from the interior of the country are taking in this Congress. Sixty-eight organizations, listed on page 522 of this issue, have already appointed representatives. The truth of the matter is that the people of the interior are awakening to the fact that we must have an adequate merchant marine.

The marine field, therefore, is under a decided obligation to give these delegates every bit of marine information that is possible and there is no better way to do this than to make this year's exposition the largest and best ever given.

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James Swan, Noted Naval Architect, to Join Editorial Staff of Marine Engineering and Shipping Age

Former Shipyard Executive, Well Known in This Country and Abroad, Resigns Shipping Board Post to Take Up Editorial Work This Month

JAMES SWAN, naval architect of the ship sales' division of the United States Shipping Board, has resigned to join the editorial staff of MARINE ENGINEERING AND SHIPPING AGE. In taking up his editorial work this month Mr. Swan brings to the magazine an intimate knowledge of the problems confronting the Shipping Board, gained by one and one half years in charge of a comprehensive survey and valuation of its fleet, together with a wealth of experience gained in the shipbuilding field both as a ship designer and as a shipyard executive.

As a preliminary to entering upon his editorial duties, Mr. Swan sailed for England on the *George Washington,* September 1, to attend the British Shipping Exposition and a meeting of the Institution of Naval Architects.

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James Swan

AN M. I. T. GRADUATE

Mr. Swan is a native of Boston, Mass. His parents were of English descent, his father's family having come from Newcastle, England, in 1635 and settled in what is now Cambridge, Mass. He was educated in the Boston public schools and the Massachusetts Institute of Technology, graduating from that institution in 1891 with the degree of Bachelor of Science in the Department of Mechanical Engineering.

Having become much interested in marine engineering which, at that time, was taught in a limited way at the Institute as a branch of the course in mechanical engineering, Mr. Swan, after his graduation, determined to go abroad for further study along this line, if it could be managed. His classmate, Charles P. Wetherbee (now vice-president and superintendent engineer of the Bath Iron Works), had already entered the French Government School of Naval Architecture at Paris and other friends had gone to Glasgow or Greenwich. The enthusiasm of Homer Ferguson (now president of the Newport News Shipbuilding & Dry Dock Company), who had just returned from Glasgow, made the latter school with its neighboring shipyards on the Clyde appear most attractive and desirable, so Mr. Swan applied himself to the task of raising the necessary funds for this purpose by teaching at the Institute and working during the summer months in the shipyards.

STUDIES NAVAL ARCHITECTURE ABROAD

In 1896, Mr. Swan entered the School of Naval Architecture at Glasgow University, studying under Professor (now Sir John) Biles. The latter's assistant at the time was Herbert Sadler, now professor of naval architecture at the University of Michigan. Among Swan's classmates were Assistant Naval Constructors Evans, Adams, Robinson and Groesbeek of the United States Navy and Commander (later Rear-Admiral) Fuji of the Japanese Navy. At this time, the late S. F. P. Thearle was one of Lloyd's surveyors at Glasgow and Mr. Swan was fortunate enough to meet Mr. Thearle and to accompany him regularly in his shipyard visits with the result that a warm friendship grew up between the two, terminating only with the latter's death.

After completing the Glasgow courses and receiving the certificate awarded to those successfully passing the final examinations, several months were spent in Professor Biles' office at Southampton, England, working on plans and calculations for various vessels and other similar work undertaken by Professor Biles in his large consulting practice.

EMPLOYED BY LEADING AMERICAN SHIPYARDS

After returning to the United States, Mr. Swan entered the office of Naval Constructor J. J. Woodward, U. S. N., at Newport News, Va., remaining in government employ for the period of the Spanish war. In the fall of 1898 he was employed by the Newport News Shipbuilding & Dry Dock Company as a draftsman and computor. He remained with this company for two years during which time the Pacific Mail Steamers *Korea* and *Siberia,* the largest ships which up to that time had been laid down on this side of the Atlantic, were designed and the battleship *Missouri,* originally intended for a 16-knot ship, was redesigned for a speed of 18 knots and an increased displacement, practically a new design. With all of this interesting work Mr. Swan was closely associated, the experience gained in Professor Biles' office being of great value, particularly in connection with the Pacific Mail ships.

In March, 1900, Mr. Swan entered the employ of the New York Shipbuilding Company, then just commencing operations at Camden, N. J. He remained in the employ of the company for 17 years, the last five as assistant to the president. From 1909 to 1914 he was largely occupied with foreign work for the company, traveling in Great Britain, Turkey, China, Japan, Russia and South America.

In 1917 the Herreshoff Manufacturing Company of Bristol, R. I., the celebrated yacht building firm, was taken

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over by new owners and Mr. Swan was called to the position of general manager of the reorganized company. Here he remained for several years during which time a large and varied amount of war work was carried out. One relatively small item of this work, which nevertheless became famous, was the building of the hull of the flying boat *N-C-4*. In the year immediately following the war a number of fine yachts were constructed at Bristol, but the cost of this class of vessel had become practically prohibitive and the yacht-building business soon was reduced to the construction of launches and small sailing craft.

Becomes President of Groton Iron Works

In 1920 Mr. Swan was offered the position of president of the Groton Iron Works at Groton, Conn., and in view of the dullness of the yacht-building business, as well as a strong personal inclination to larger work, he accepted this position. The owners of the Groton plant had rather ambitious plans for its development, but the expected work did not materialize, and, after a year spent in the construction of a steel propeller ferryboat for the city of Boston and some miscellaneous small work, the plant was permanently closed.

Government Work

Early in 1921, the Ship Sales' Department of the Emergency Fleet Corporation undertook a comprehensive valuation of its fleet and Mr. Swan was called to Washington to carry out this work. It was a task of considerable magnitude and included a detail survey of all the laid-up Shipping Board vessels, about 900 in number. For the survey, a large staff was employed, the actual physical survey occupying about three months' time. The results of all this work are now being tabulated and the final report of survey and valuation is nearing completion.

United American Lines Inaugurate New Coast Service

THE Intercoastal freight and passenger service recently announced by the United American Lines, will be opened by the steamship *Sudbury,* which will sail from Baltimore on September 8 and from New York, September 13. Fourteen modern vessels will operate in a weekly service between Baltimore and New York, Los Angeles Harbor, San Francisco, Portland, Seattle and Tacoma.

The *Mount Clinton* and *Mount Carroll,* formerly in the transatlantic trade, which are now being converted into cargo carriers with cabin accommodations for a few passengers, will be included in the fleet. All the vessels to be used in this service will be over 10,000 tons deadweight, thus making the fleet one of the largest in the intercoastal trade.

The United American Lines have taken over the branch offices in Pittsburgh and Buffalo, formerly maintained by Houlder, Weir & Boyd. Beginning August 27, C. H. Sprague & Son have been acting as agents for the line at Boston and Trosdal, Plant & LaFonta will act as agents at Philadelphia. Branch offices of the line are also located at Baltimore and Chicago. The Pacific coast headquarters will be located in San Francisco, Cal.

Crook Shipyard Sold.—The municipality of Baltimore is buying the extensive shipyard properties of the Crook Shipbuilding Company, that city, for $440,000. The property includes a frontage of 462 feet on the harbor and extending back 1,600 feet, a 600 by 80 foot pier with a 565 by 60 foot building thereon, a 320 by 115 foot warehouse of 350,000 square feet floor space, 2,500 feet of railroad sidings, two-story office building, etc. The city will make use of the Crook properties in connection with an expenditure of many millions of dollars for harbor improvements.

Yachts as Naval Auxiliaries

By Norman L. Skene

ONE lesson that should have been learned by this country from the recent war is the usefulness of yachts and yachtsmen in time of war. More than 650 yachts and motorboats were taken over by the Navy and performed highly useful service of various sorts such as gunboats, hospital ships, dispatch boats, coastal patrol, training ships and station boats. It was as training ships probably that the converted yachts were most useful. Knocking around at sea for a few weeks in a small vessel teaches more real seamanship to the raw recruit than months of drill on land or on large vessels.

Yachts of all kinds were taken, even sailing yachts. A few yachts were bought outright but most of them were practically given or loaned to the Government by patriotic owners. Such yachts as were not destroyed or retained by the Navy were returned to their owners very much the worse for their war service.

Yachtsmen Make Good Naval Officers

A secondary advantage of a large yachting fleet is the potential military value of its personnel. Experienced yachtsmen are the best of material for expanding the personnel of the Navy in time of war and in the World War a great many American yachtsmen demonstrated this conclusively, filling positions of importance in all branches of the Naval service. A yachtsman invariably acquires an intimate knowledge of the handling of boats under various conditions that is the basis of real seamanship.

With the fact of the usefulness of yachts and yachtsmen to the Navy in time of war so recently and conclusively demonstrated, it would seem wisdom on the part of our Government to offer every encouragement to the development of yachting. The present policy of heavily taxing yachts is certainly no encouragement and should be abandoned. The sales tax of ten percent in addition to a substantial annual user's tax added to the excessive cost of building and operation under present conditions are very real deterrents to new construction. Yacht building is at a very low ebb due to above conditions and needs every encouragement. The British Government recognizes the importance of yachts as naval auxiliaries and places no tax on them.

Navy Requirements Too Drastic

It is true that yachts "built according to plans and specifications approved by the Navy Department" may be exempt from taxation but this provision offers no real relief for the requirements are so drastic that few if any yachts will be built in compliance with them. The following are a few of the requirements:

Length between perpendiculars to be not less than 200 feet.
To be constructed with watertight subdivisions equivalent to naval practice.
To have 2,500 miles steaming radius.
To be capable of carrying an armament of four or more guns of at least 3-inch calibre and four AA machine guns with magazines to carry the standard ammunition allowance.

Suitable Vessels Should Be Subsidized

It would be good policy not only to exempt yachts fulfilling requirements such as these but to subsidize them as an incentive to build such vessels. The requirements should be ameliorated to include vessels of the size and type of the 110-foot sub-chasers of which so many were built during the war, or even smaller, as one of the lessons learned from the recent war was the value of small fast motorboats even as small as forty-feet length for certain naval uses. The adoption of a policy of encouragement of yachting on the part of our Government involving the abolition of taxes and the subsidizing of certain types would be a very wise move.

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Shipping Board Policy Still Unsettled

Division in Shipping Board and Appointment of Advisory Committee by President Prevents Precipitate Action

By Harold F. Lane*

DEVELOPMENTS since the death of President Harding have made it increasingly evident that no precipitate action is likely to be taken to change the present policy of the Shipping Board as to the manner of operating its fleet and with each day of delay the danger that a policy of direct Government operation will be adopted appears to grow less. President Coolidge is yet to be convinced as to either the advisability and practicability or the legality of the proposed plan of operation of the Shipping Board vessels by a group of Government financed subsidiary corporations.

As to the legality of the plan, he expects to ask an opinion of the Attorney-General and as to the merits of the plan in general he is thinking of seeking advice from outside of the board by the appointment of a special committee consisting of the Chairman of the Shipping Board, the Secretary of Commerce, the Secretary of the Treasury, the chairmen of the Senate and House committees having merchant marine affairs in charge and possibly one or two others, to study the question.

This was officially announced at the White House on August 21, following several conferences between President Coolidge and Chairman Farley and other members of the board. The President does not, however, consider the plan of operation through subsidiary corporations, of which the stock would be owned by the Government, amounts to "direct" Government operation in any technical sense and he is represented as referring to it rather as "indirect" Government operation, but he has also made it plain that no change in the present plan is likely to be adopted without careful consideration, although he is hopeful that some plan can be devised to reduce the present losses.

Subsidiary Corporations, Lasker's Plan

The subsidiary plan has heretofore been generally referred to as providing for "direct" Government operation by former-Chairman Lasker, President Harding and Chairman Farley. It has also come to be referred to frequently as the Lasker plan because in his letter of resignation to President Harding, Mr. Lasker said that, with the failure of the subsidy bill, and if the ships could not be sold by the board on favorable terms, the only apparent alternative is to "go the full length of direct Government operation" and he recommended the creation by the Emergency Fleet Corporation of 12 to 18 subsidiary corporations. President Harding had also expressed general approval of this idea in a speech in which he said that direct Government operation would be "aggressively pursued," if that turned out finally to be the only alternative.

Some significance in this connection has been attached to the announcement by President Coolidge that he intended to carry out the policies of his predecessor in office, but he has also indicated that this statement applied "in general" and that the policies might necessarily be subject to such changes as President Harding himself would have made if he had lived. Moreover, so far as known, President Harding had never specifically approved any definite plan of Government operation and it is well known that he frequently condemned the principle of Government operation, viewing it only as a final alternative. As no definite feasible substitute for the present system of operation was laid before him, it can hardly be said that President Coolidge is in any way committed.

Moreover, there is a sharp division in the Shipping Board itself as to the plan which should be adopted. Sanction to the plan of subsidiary corporations was given by a bare majority when a vote was taken about August 1, it is learned, Chairman Farley and Commissioners O'Connor, Thompson and Lissner voting in approval, while Commissioners Benson, Plummer and Haney recorded their opposition. No official announcement has ever been made of this fact nor have the details of the plan been made public.

Chairman Farley of the Shipping Board on August 16 submitted to the President a detailed written report covering the views of the board as to what ought to be done and it was later stated at the White House that several statements on the subject were before the President and would have careful consideration before a decision was reached as to what, if any, changes should be made. Chairman Farley also had another conference on the day before the announcement of the proposed appointment of a committee. Commissioner Plummer, who is one of those opposed to the plan, has also presented his views to the President. Chairman Farley had also stated that the Government would not put a new shipping plan into effect until after representatives of the shipowners' and ship operators' organizations had had an opportunity to present alternative plans. It is understood that the details of the plan voted on were prepared by the special committee, composed of Chairman Farley and Commissioners O'Connor and Thompson, appointed on June 4, and were based on the recommendations of Mr. Lasker in his letter of resignation.

Direct Operation, Alternate Plan

Commissioners Plummer and Benson are reported to favor methods of direct operation which will give the present operators an opportunity to secure freight for the board's vessels on a commission basis, but which would leave them no part in the handling of the boats. Commissioner Haney is said to regard direct operation of any character as permissible only as a last resort. It is also understood that while Commissioner Lissner is in favor of the subsidiary plan for those operations conducted by the Government, he still is in favor of making every effort to sell as many of the lines as possible for private operation. The claim made for the subsidiary plan is that it would be much easier to sell a line as a going concern with its good-will, organization and terminal facilities, by the transfer of a certificate of stock than to sell simply a certain number of ships for operation on a line where the good-will and going concern features are under the control of the managing operators.

The position of the minority was that the proposed transfer of the ships to subsidiary corporations would involve a delegation of the trusteeship of the Emergency Fleet Corporation which would be illegal, and also that the plan would be impracticable. They insisted at least on an opinion from the Attorney-General as to the legality of the plan, although the legal department of the Shipping Board is said to be of the opinion that it is legal.

Owners and Operators Confer with Board

Representatives of the shipowners and operators were given an opportunity to present alternative plans at a conference

* Our Washington correspondent.

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with members of the Shipping Board at Washington on August 28. This conference was originally set for August 21 but was postponed at the request of the shipping men. One plan proposed by the American Steamship Operators' Association was formally rejected by the Shipping Board after a long session on July 24. Chairman Farley issued a statement saying that the plan proposed that the board deliver to the operating companies the needed vessels to maintain service on the present established routes for the absolute control of the operating company without board supervision, the board to pay the expenses and any losses and the profits to be set aside in a special fund for the use of the operators to buy ships from the board. This, he said, "has all of the inherent defects of the present M. O. 4 contract which is to be abandoned, and adds a number of other objections." He added that the board hoped to be able shortly to make a definite statement of the plan for direct operation on which it was working.

Later the operators' association made public a formal statement protesting against direct Government operation of ships and saying that such a policy would bring about complete failure of the efforts authorized by Congress to develop a privately owned merchant marine. Further correspondence brought forth letters from Mr. Farley to the Steamship Owners' Association and the Ship Operators' Association stating that while the board had fully considered their proposals it would be glad to discuss the situation further with them at any time and the arrangement for the new conference resulted. In these letters Mr. Farley referred to two of the objections to the proposed plans as follows: "Your plan provides no supervision and control of the expenditure of Congressional appropriations, and in addition contemplates the establishment of a sinking fund to be carried over a minimum of three and a maximum of six years. Manifestly, both or either of the above provisions are impossible of execution under the present law."

U. S. Chamber of Commerce Opposed to Government Operation

A committee of officers of the United States Chamber of Commerce called on the President on August 20 to put before him the position of American business on important economic questions and on the subject of the merchant marine told him that the chamber is opposed to the Government engaging in commercial business. It believes that further efforts should be made to evolve a plan of operation by private citizens before entering upon Government operation. The chamber favors the ship subsidy in the effort to equalize operation disadvantages of American ships and it has asked an investigation of the possibility of relaxing the burdensome restrictions.

American Marine Congress Grows Bigger and Bigger

NO better indication of the interest that is being taken in the all-American Marine Congress which will be held in New York during the week of November 5-10 could be desired than the long list of representative organizations who will cooperate, printed below. That which is needed above everything else is a definite expression of facts and findings that will represent the non-partisan opinion of all sections of the country on what ought to be done to establish our merchant marine.

Organizations Cooperating Together with Name of Contact Representative

American Manufacturers' Export Association, Myron W. Robinson; Council of American Shipbuilders, Homer Ferguson; American Steamship Owners' Association, Winthrop L. Marvin; United States Ship Operators' Association, Charles H. Potter; New York Tow Boat Exchange, Fred B. Dalzell, Jr.; Neptune Association, Capt. John F. Milliken; National Board of Steam Navigation, N. L. Cullen; Lake Carriers' Association, William Livingstone; National Marine Engineers' Beneficial Association, William S. Brown; Ocean Association of Marine Engineers, T. A. King; New York Boat Owners' Association, William H. Kelley; Hudson River Improvement Association, Clarence R. Birkett; South Atlantic States Association, Matthew Hale; Atlantic Coast Shipbuilders' Association, Clarence S. King; Maritime Association of the Port of New York, John Dowd; American Marine Association (Officers and Executive Committee); Society of Naval Architects, Captain C. A. McAllister; Charleston Chamber of Commerce, Charleston, S. C.; American Society of Marine Designers, C. C. Jacobson; Propeller Club; American Association of Advertising Agencies, James O'Shaughnessy; The National Association of Cotton Manufacturers, Henry C. Meserve; American Bureau of Shipping, Capt. C. A. McAllister; United States Navy; City of Buffalo, N. Y., Mayor Frank X. Schwab; The Railway Car Manufacturers' Association, W. F. M. Goss; National Merchant Marine Association, Henry C. Wiltbank; American Society of Naval Engineers, Rear Admiral C. W. Dyson; United States Pulp Producers' Association; Chamber of Commerce of the United States; United States Shipping Board; The Commission of Public Docks, of Portland, Ore., G. B. Hegardt; City of New Orleans, La., Mayor A. J. McShane; City of Detroit, Mich.; American Association of Engineers, Fred Lavis, A. M. Knowles, and I. C. C. Cooper; National Association of Credit Men, Edward P. Tuttle; American Engineering Standards Committee, A. W. Whitney; United States Department of Commerce; National Paint, Oil & Varnish Association, Harry J. Schnell; The American Legion, E. E. Spafford; Omaha Chamber of Commerce, George Carey; Detroit Board of Commerce, Charles E. Boyd; American Marine Standards Committee, Capt. R. D. Gatewood; City of Newark, N. J., P. H. W. Ross; American Institute of Mining and Metallurgical Engineers, Philip W. Henry; City of Portland, Oregon, Mayor George L. Baker; The Port of New York Authority, Eugenius H. Outerbridge; Lorain Chamber of Commerce, Lorain, Ohio, G. W. Dudderar; Harbor Department City of San Diego, Cal., J. W. Brennan; National Safety Council; Madison Association of Commerce, Madison, Wis., Don E. Mowry; Minneapolis Civic & Commerce Association, Herbert M. Gardner; Mid-West Farmers' & Manufacturers' Conference, Malcolm Stewart; Fidelity Marine Association of Masters and Mates, Capt. N. L. Proctor; American Farm Bureau Federation, O. E. Bradfute; Committee of Manufacturers on Standardization of Valves and Fittings; Passaic River Improvement Association, Edw. B. Lyman, Director; New York Freight Forwarders' and Brokers' Association; Savannah Board of Trade, Savannah, Ga., Devereauz Bacon; Cincinnati Chamber of Commerce, Cincinnati, O., Malcolm M. Stewart; City of Camden, N. J., Hon. Victor King, Mayor; International Association of Machinists, Alfred Peabody, Joseph L. Maxwell, Julius Meyers, George Rolph, John F. Dalton; City of Wilmington, Del., Hon. George W. K. Forrest; Portland Steamship Operators' Association, Frank Ira White; City of Philadelphia, Pa.; Hon. J. Hampton Moore, Mayor; City of Trenton, N. J.; City of Chester, Pa.; City of Pittsburgh, Pa.

Standard Oil Tugboat Launched

SOCONY NO. 9, the second of two steel single screw tugboats building at the Tebo plant of the Todd Shipyards Corporation for the Standard Transportation Company, New York, was launched on August 6.

These tugs are to be equipped with vertical, compound, surface condensing engines with cylinders 18½ and 40 inches diameter by 26 inches stroke, designed for a speed of 125 revolutions per minute, built at the Todd plant at 742 East 12th Street, New York. The boilers will be three-furnace Scotch marine, 14 feet 9 inches inside diameter and 12 feet long, with a grate area of 75 square feet, a heating surface of 2,700 square feet and a working pressure of 160 pounds per square inch. Todd fuel oil burners will be installed.

The dimensions of the boats are: Length overall, 105 feet 9 inches; length between perpendiculars, 100 feet 5 inches; breadth molded, 24 feet; depth molded, 12 feet 9 inches; draft loaded for sea, 10 feet 6 inches, forward; 12 feet, aft, in salt water.

New York Central Buys Weehawken Piers

THE Cunard Steamship Company has resold the 800-foot pier, K-44, south of the West Shore ferry terminal at Weehawken, N. J., to the New York Central Railroad Company, and also the old D. and H. coal dock, at the foot of Baldwin Avenue, half a mile south of the pier, to the same company. The latter will be remodeled and the railroad company will use both as freight piers. Former plans of the Cunard Line in connection with this development have been dropped.

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"Homer" and "Joe"—Master Shipbuilders

A Résumé of the Accomplishments of Two Outstanding Leaders in the Shipbuilding Industry

By "Old Scotch"

NOW that those of us in the shipping business have, by force of circumstances, time to cogitate over the past, present and future it is well to glance back a few years and consider some of the remarkable feats performed in the great shipbuilding boom which we passed through as an incident of the Great War.

Important industrial accomplishments, such as the completion of this greatest shipbuilding feat of all time, cannot be carried on without developing or utilizing some outstanding men, as the personnel is bound to be reflected in the outcome of any human undertaking. Our shipbuilding facilities of pre-war years were "naturally" quite limited both as to physical equipment and personnel. Of this limited personnel all of them proved their mettle and became leaders among the thousands and thousands of men from all walks of life who rushed to the shipyards, in answer to the nation's call.

The leaders of the pre-war shipbuilders quite naturally became the super leaders of the greatly expanded industry, during and just following the fevered activities incident to so vast an undertaking, which involved the investment of the stupendous sum of over three and a half billions of dollars in yards and ships.

Two Outstanding Leaders

Without disparagement to many other leading characters in this great work, we can all agree that two of the outstanding men in the great rush were Homer Ferguson of the Newport News Shipbuilding and Dry Dock Company and Joe Powell, the man in direct charge of the vast shipbuilding activities of the Bethlehem Shipbuilding Corporation.

Few there are among the large armies employed in the wartime shipyards, who did not know these two men either personally or by reputation; hence the title of this brief résumé of a "close-up" of these personalities.

Joe Powell, a born-and-bred New Yorker, and Homer Ferguson, a product of the old North State, have much in common, although representing the old civil war division of the country, the North and the South. Both were blessed with comely countenances, genial dispositions, the faculty for making friends to a marked degree, brilliant minds and unbounded energy. Both were educated under the tutelage of Uncle Sam at Annapolis, and both received that distinctive reward of scholarship, appointments to the Navy Construction Corps, which in common with the Engineer Corps of the Army brands the wearers of the insignia of their respective corps, as men of the highest scholarship and attainments.

American Merchant Marine, Their Religion

Both had the foresight, energy and opportunity to sever their connections with the Government, before advancing years and accumulated "fogies" had lulled their ambitions to a state of lethargy. Both absorbed the business acumen necessary for positions of great responsibility in a remarkably short space of time, and both with equal fervor made the advancement of everything that pertains to a strictly American merchant marine not only a hobby but a religion. When the time came for great accomplishments in their chosen profession they were on the job and not lacking a single attribute, physically or mentally, to make a success of the huge responsibilities which were to fall to their lots.

Through the lamented loss of President Hopkins on the *Lusitania,* his mantle fell on the capable shoulders of Homer Ferguson, who had by that time worked his way up to the vice-presidency of the great Hampton Roads plant.

Joe Powell had gone from the position of assistant to the president of the William Cramp and Sons Ship and Engine Building Company to the presidency of the Fore River Ship and Engine Company, and, upon Mr. Schwab obtaining control of this concern and merging it with five other yards, he quite naturally placed the entire shipbuilding branch of the Bethlehem company under the direct charge of the hustling young executive, whose services he had obtained with the Fore River yard.

With such important positions of responsibility these two men began what was to be the most serious work of their lives—the fulfillment of the enormous demands for ships which were placed on these respective establishments. Equipped as both were, there was no chance of failure—success for their efforts was foreordained. From early in 1917 until the completion of the wonderful output of both naval and merchant vessels in 1920, it is doubtful if there were two busier men on earth than this same Homer and Joe. Back and forth to Washington, the seat of government, where their services and advice were almost constantly in demand, this busy pair were almost like shuttlecocks. Everywhere they went they radiated encouragement, spirit and "pep" to their assistants and to the officers of the Government who were demanding more than the capacity of the yards under their control.

Some one asked Joe Powell his permanent address during those troublous days, and his reply was the "Hotel Pullman," and indeed there were very few days that he was not contributing to that perambulating hostelry in his frequent trips between Bethlehem, Boston, New York, Wilmington, Baltimore, Washington, San Francisco and others places, attending to the various ramifications of the largest private shipbuilding organization the world has ever seen.

A Convincing Speaker

If any one could have guessed Homer Ferguson's whereabouts on any particular day in the future, he would have had to be gifted with second sight. If any week passed during the entire war when Homer was not wanted on some committee work in either Washington or New York, it has not been recorded. You see, Homer among his other attributes had obtained wide fame as a speaker. As one of his colored employees expressed it, "Mr. Homer certainly am the convincinest man"—a natural tribute to his skill in dealing with his workingmen, the majority of whom are and have always been descendants of Ham.

The story of how he "got that way" is quite interesting. Early in his shipbuilding career he had quite a local reputation as a speaker at launching banquets, church socials and other community gatherings. Some of his friends hearing of it, decided to try him out at the annual banquet of the American Society of Naval Engineers, an affair which, held at Washington, usually attracted some of the best postprandial speakers from Congress and the Department. On the night of Ferguson's debut, and first appearance in the Big League, it so happened that the question of building battleships at Navy Yards in competition with the private yards was acutely in the public mind. Among the congres-

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sional speakers was the Hon. John J. Fitzgerald of Brooklyn, who could not see much good in any naval appropriation, wherein his pet Navy Yard was not recognized. "Fitz," as he was known, was even then a very important member of the Appropriations Committee, and, as a general all-around debater and parliamentarian had few equals on the floor of the House. "Fitz" and "Fergy" locked horns at the drop of the hat, and the banqueteers were treated to a debate which has long been remembered. The recruit from the Newport News Bush League of Oratory did not come off second best by any means, as Fitzgerald closed his remarks by saying, "If Mr. Ferguson builds ships as well as he argues, I have no fear for the future of our Navy."

Subsequently, Ferguson made his initial address at the banquet of the American Society of Naval Architects at the Waldorf in New York. A certain cabinet officer opined that all that American shipyards needed, was to build standardized ships, to meet overwhelming success. This aroused Ferguson's ire, and the way that he bowled over the cabinet officer's arguments has become a classic in the Society. Since these two events Homer has obtained a nation-wide reputation as a public speaker, a reputation which eventuated to a large extent, in his being elected president of the United States Chamber of Commerce.

An Able Congressional Witness

A thorough knowledge of his subject, and a most convincing manner of presentation makes Homer Ferguson one of the ablest witnesses who ever appears before a Congressional Committee. During the early stages of the war, when everything seemed to be going to the bow-bows abroad, and nothing seemed to be able to start at home, Ferguson appeared before a Senate Committee to get money enough to start a housing proposition, necessitated by the vast increase of war workers in Newport News. Delays and visiting around the departments had nearly driven him to distraction. Hence when he appeared before the solons on the Hill, he was in a fine state of mind to state the needs of the hour. When Homer is deadly in earnest his eyes have a faculty of weeping to emphasize his seriousness. On this particular occasion several of the older senators became so impressed with his statements that they too wept with the witness. The chairman was so overcome with emotion that he did something never before heard of in the annals of legislation. At the climax of Ferguson's appeal the presiding officer said very solemnly: "Mr. Ferguson, if you can stay in Washington for 24 hours, I'll appoint a sub-committee to go with you to the housing officials and see that you get the money to start this proposition at once."

Ferguson stayed, and the money was made available in four hours.

Joe Powell accomplished great things during the war; although he does not possess the eloquence of Homer, his business rival, he has other ways of putting things across. Added to his winning personality there is a persistency of purpose in Powell's make-up that usually lands the bacon. This is best illustrated by an incident in his career which occurred after he had withdrawn from his shipbuilding activities. Let it be said here that our much-beloved and lamented President Harding knew both Homer and Joe and knew them well. Either one of them could have been Chairman of the Shipping Board if they would have accepted that position from the President.

Finally President Harding in his very persuasive manner, succeeded in getting Joe Powell to serve as president of the Emergency Fleet Corporation for a brief time. He consented to do this without pay, but, as the law prevents any one from serving the Government for nothing, he had to take $1 per month. His first month's pay check was mounted in a frame and used as a paper-weight. As it cost him $3 to have this $1 check mounted, Joe allowed it was rather an uneconomical proposition.

The Leviathan

It was during his brief incumbency of this job that he conceived the idea of reconditioning the *Leviathan,* then rapidly deteriorating at her Hoboken dock. He satisfied himself that it would be a paying proposition and, with the approval of the President and the Chairman of the Shipping Board, he tackled the job in typical Powellesque manner. If any one thinks this was an easy task, just let him recall the bitter fight made by Powell's best friends in Massachusetts to have the reconditioning done in the Boston Navy Yard. Threats and entreaties availed not, as Joe was firmly convinced that the job could be done for less money and in less time at a private yard. How well it was done and how successful the large ship is panning out are facts too recent to need repetition here. By the way, in all the press acclaim of credit for this splendid reconditioning job has any one heard Joe Powell's name even mentioned as having had anything to do with it? I haven't!

Throughout the long trying months of the war these hustling shipyard leaders kept up the pace and delivered ship after ship to a world whose principal need at the time was ships, ships and yet more ships. Their earlier training, both physical and mental, stood them in good stead, and they were able to withstand the terrible pressure put upon them. Both are yet in the prime of their lives, and, if shipbuilding does not offer sufficient employment for their boundless energies, they may have to go into other lines of effort. Homer Ferguson is trying to get enthused over building box cars and automobile wheels at the Newport News plant, but he admits that anything that floats is much more attractive to him.

Perhaps this idea of "anything that floats" may account for the besetting sin of both Homer and Joe. I had almost concluded not to give these great men away as to their weaknesses. Strange to say they are both afflicted with the same shortcoming, so as a matter of candor to the readers I will have to divulge it. Its "ducks, ducks and yet more ducks" that afflicts them both. This may be and probably is because ducks float and can go through the water rapidly. However, it is well known to the intimate friends of both these men, that if either Homer or Joe should hear a duck quack or a wild goose honk, even while those shipbuilders might be negotiating a contract they would both instinctively grab a suit-case and a shot gun, and beat it for the nearest blind. When they would meet, as they formerly did quite frequently, it was not "how many keels have you laid?" but "how many 'red heads' or 'canvas backs' did you bag on your last trip to the island?"

Self-discharging Barge.—A novel type of tipping barge in which, by means of trimming tanks, a deck cargo consisting of about 300 tons of quarried stone may be automatically discharged to either side of the craft, was recently shipped to West Africa. It forms one of four such barges which will be used in connection with the building of a new breakwater at Takoradi by Stewart and McDonnell for the Crown Agents for the Colonies. These vessels were built at the Lytham Shipbuilding and Engineering Company, Limited, their construction and the tests on them being carried out by Flannery, Bagallay and Johnson, Limited, of London. The trimming tanks are arranged along either side and are divided into four by three transverse bulkheads. The design is so carried out that the bottom of the tanks is higher than the flotation level when the vessel is light. When loaded with deck cargo the ship is taken to the dumping site and sluice valves are opened, which admit sea water to the tanks on the side it is desired to discharge from. The barge is thus automatically careened to such an angle that the deck cargo is shot overboard, and, relieved of the weight, the vessel rises and empties the tanks. —*The Engineer.*

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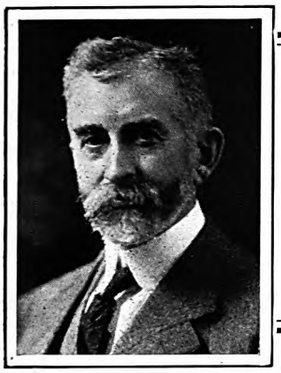

Efficiency and Economy in Traffic Work

By Herbert Sheridan*

NOW that the country has assumed its stride and trade conditions generally have greatly improved, the obstacles that lie in the path of satisfaction are interwoven with efficiency in traffic and transportation matters, or the lack of it. The prompt and dependable movement of traffic between producer and consumer assume even larger than normal proportions. The plant expects prompt receipt of raw materials, the jobber looks for prompt movement from the mills, the country merchant wants to get his purchases without delay. All these interests include the welfare of communities that are affected when completion of public works is delayed.

Campaigns for "safety first" have accomplished much. Campaigns for prevention of claims have always produced gratifying results; but there is still much to be said and much more to be done in the way of driving the lesson home to a great many people who have not seen the vision of quicker returns on capital, greater satisfaction to customers and lessening of exasperating incidents, because common sense methods are not more generally used in getting traffic under way and properly safeguarded.

Fortunately, there has been a noticeable improvement in the plan of having a specific department take care of receipts of materials and merchandise and a shipping department more or less well equipped to insure the proper marking, billing and routing of valuable property, for which the traveling man has incurred expense and frequently secured under adverse conditions. Generally there is a lack of care in suitably preparing property for shipment. There is room for improvement in the sorting of articles, so that the classification will be observed and, when possible, articles of the same classification put into the same package. There should be a more general custom of packages containing slips, showing the name of the shipper as well as the name of the consignee.

Stencils Should Be Used for Marking

The outside marking would be much more legible, if stencils were used, and although receiving agents are instructed to insist on shipments being properly marked, it is a lamentable fact that many shipments still go astray through lack of sufficient and thorough marking. Shipping orders and bills of lading should be made out on the typewriter when possible, for the sake of legibility. The one in charge of shipping should know what system of package cars prevails and so time his shipments that these can be used.

Consignees could materially aid themselves and many other interested people, carriers, producers and consumers by a much more prompt removal of property from the terminals on arrival instead of allowing teminals to be cluttered up with continued receipts of shipments.

The word "service" has come into strong play, and nowhere is it more needed than in the entire transportation game. When each man has a considerate regard for the other and is willing to be informed about some of the difficulties that transportation companies have to contend with, in order to supply the desired service, and will give special heed to the suggestions as to his part in the desired betterment, there will be a decrease in the cost of operation and a noticeable improvement in the service the transportation companies strive to give.

Traffic Clubs

One of the most beneficial things that has come about lies in the formation of traffic clubs, wherein through membership in an organization composed of railroad men and those engaged in the manufacture and distribution of merchandise, many vital subjects are spread out for review, consideration and betterment. A spirit of tolerance has been developed, because through these traffic clubs, there has been maintained an increased knowledge of some of the hardships that are peculiar to the subjects of traffic and transportation. There are also organizations of standing that are imparting instruction about these subjects; among the most prominent is the LaSalle Extension University of Chicago. This organization has a large staff of instructors, competent to impart much valuable information and it has the endorsement and friendly regard of a number of prominent officials in the traffic field.

All that is said about some of the inland difficulties apply with equal force to the constantly growing coastwise steamer traffic. Many shippers are anxious to determine which is the better way to reach their remote customer, that is, whether to send shipments to the Atlantic seaboard for movement through the canal, thence to a Pacific coast port and by rail to an inland point; or ship all-rail as heretofore. Fortunately, tariffs are available that define the classifications applicable, the rates in cents per one hundred pounds, the transfer and other terminal charges at ports and rates to the interior, so that the uncertainty as to comparison of cost can soon be removed. Other coastwise steamer service involves a knowledge of service rendered by the different companies, schedules of their sailings, tariffs showing rates between interior and coast ports, as well as port to port rates. Specific information, including the subject of insured rates, can always be obtained from the nearest representative of the various lines. Water transportation is receiving more and more attention, and very properly so, because with the rapid growth of our country, railroad building has not kept pace with developments. Increased reliance has been placed on water movement, which has reacted greatly to the advantage of many sections of the country.

*Traffic manager, Merchants and Miners Transportation Company, Baltimore, Md.

Gyro-Compass Course for British Officers.—Owing to the growing importance of the gyro compass in the navigation of modern ships, every British naval officer who has qualified in the navigation of first class vessels is required to go through a gyro-compass course of two weeks' duration at the Admiralty Compass Observatory, Ditton Park, Langley, Bucks. Those that have had gyro instruction are required to take refresher courses at intervals of three years.

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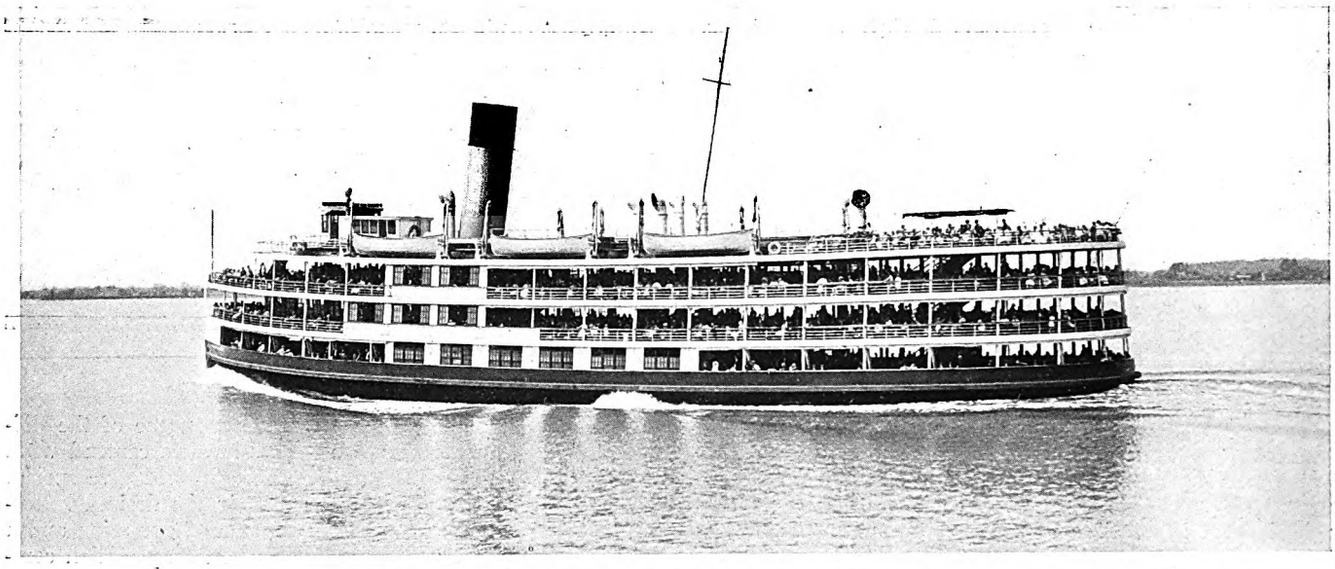

New Wilson Line Excursion Steamer State of Delaware

Two Excursion Steamers Built for the Wilson Line

New System of Construction Increases Strength and Reduces Vibration — Features Introduced for Safety, Comfort and Entertainment of Passengers

TWO new excursion steamers, the *State of Delaware* and *State of Pennsylvania,* plans and specifications of which were prepared by the George G. Sharp Company, naval architects and consulting engineers, 30 Church Street, New York City, have recently been built by the Pusey & Jones Company, Wilmington, Del., for the Wilson Line of Wilmington and placed in operation on the Delaware River.

The addition of these two new steamers to the line have enabled the management to provide a much more frequent schedule between Philadelphia, Riverview Beach and intermediate points. Two and one-quarter hours are consumed in the Riverside Beach run, a distance of about thirty-five miles, each vessel making two round trips per day and in the evening a moonlight excursion down the river from Philadelphia.

The Wilson Line's policy is to keep their regular passenger fleet up to date by the addition from time to time of new vessels specially adapted to their requirements and embodying the latest developments in the field of naval architecture. Their steamers have invariably been in advance of their time, and it is already apparent that the latest additions to the line fully maintain the reputation and traditions of the company. The long experience and intimate knowledge of the service made available to the architects by Captain Horace Wilson and Mr. J. S. Wilson of the Wilson Line has resulted in a design being developed which marks a distinct advance in the economics of operation and structural design.

New Type of Construction Introduced

Since the conditions of service limited the extreme length of these vessels to 225 feet it is obvious that the difficulties attendant upon providing ample space, unobstructed vision and means of entertainment for 3,500 passengers in a comfortable atmosphere were not inconsiderable, nor would they have been overcome by reproducing the type of excursion steamer to which we have become accustomed. The means whereby results have been achieved are of interest by reason of the advance they mark in the methods of construction.

Instead of adopting the usual method of superimposing one deck upon another a new system of trussed lattice framing was developed whereby all the structural members from the bottom of the hull to the uppermost superstructure deck were assembled into a single rigid unit. The resultant structure is as solid and free from vibration as the superimposed type is conducive to this source of discomfort so frequently met with in passenger steamers of light construction.

Although these two vessels have equal capacity to the combined regular fleet of four vessels in the Wilmington-Philadelphia service, their daily fuel consumption in service, it is reported, has shown an economy of over thirty-five percent when compared with that of the original fleet.

Structural Arrangement

The hull is constructed on a special system of trussed lattice framing, consisting of wide spaced deep frames and beams up to the first superstructure deck with steel tie beams at each of the superstructure decks above, combined with continuous columns run from the main frames or deck beams to the uppermost deck of the superstructure. These columns are in one piece, or efficiently jointed as may be necessary for loading or other local conditions, and along with the diagonal members are riveted at all intersections of beams, frames or floors. The complete frame units were erected and regulated ready to receive the intermediate frames and fore and aft steel girders. When these had been erected the intermediate beams and carlins of the superstructure decks were erected, thus permitting the construction to proceed on all or as many decks as was found desirable.

It should be noted that the familiar guard braces have been dispensed with, the truss construction of the main framing satisfactorily supporting the overhanging sides of the main deck.

The shell plating is overlapped at the butts and seams, but the main deck is laid flush to receive Rubberstone decking with which it is covered.

The boiler casing is of steel extending to the boat deck

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General Data: New Wilson Line Excursion Steamers

General Information

Service: Delaware River and Bay Excursion Service.
Builder: Pusey and Jones Company, Wilmington, Delaware.
Owner: Wilson Line, Wilmington, Delaware.

Characteristics

Length, overall	225′ 0″
Length, B. P.	219′ 0″
Breadth, molded, main deck	48′ 9″
Breadth, molded over guards	59′ 0″
Breadth, molded at waterline	45′ 9″
Depth, molded	13′ 7″
Draft	9′ 6″
Speed, loaded, statute miles	18
Framing	Trussed lattice
Class	American Bureau of Shipping
Deadweight capacity	360 tons

Equipment

Anchors:
2 Bowers stockless ..... 1,050 lbs. each

Chain:
Length ..... 90 fathoms 1 1/16 stud link
2 hawsers ..... 50 fathoms 7″ Manila
4 hawsers ..... 25 fathoms 6″ Manila

Complement

Deck officers	4
Deck crew	16
Engineer officers	3
Engineer crew	5
Purser's and steward's department	14
Total officers and crew	42
Total passengers	3,500
Total complement	3,542

Deck Machinery

(Number, Size, Type)

Steering gear, 1, 6x6, steam—drum type.
Windlass, 1, 7½ HP., electric driven vertical with capstan.
Capstan, 1, 7½ HP., electric driven.
All American Engineering Company make.

Life Saving Equipment

	No.	Type	Length	Capacity
Lifeboats	6	Steel	24—0	41
Working boats	1	Steel	16—0	—
Life rafts	4	Steel	21—0	34
Total	11			
Ring buoys	6	Cork		
Ring buoys	6	Cork	Luminous	
Life preservers	3,550	Cork		

Propelling Machinery

Boilers

Number	2
Type	Babcock & Wilcox, watertube
Furnaces	5 per boiler
Fuel	oil
Draft	assisted
Total heating surface, sq. ft.	7,478
Working pressure, lbs. per sq. in.	210

Normal fuel consumption
At full speed 400 gallons per hour
Normal steam production, lbs. per hour per pound of fuel 13½

Engines

Number	One
Type	Triple exp., 4 cylinder
Horsepower	2,900

Propellers

Number	One
Type	solid
Diameter	9′ 4″
Pitch	14′ 3″

Auxiliary Machinery

(Number, Size, Type)

Machinery Space:
Condensers—1, 5′ 6″ D x 7′ 10½″ L, surface condensing. 3244 ⅝″ ODS tubes, two-pass.
Filters, tank—1, 5′ 7″ x 4′ 0″ x 3′ 0″.
Feed water heater—1, No. 16, Reilly Type G.
Fuel oil heaters—3, 12″ x 50″, Coen.

Pumps:
Circulating—1, 12″ suction, 10″ discharge, 9″ x 9″ Engberg Eng., Pusey & Jones Co., fan pumps.
Bilge—1, 6 x 6 x 6, Warren vertical duplex.
Sanitary—1, 6 x 6 x 8, Warren vertical duplex.
Feed pumps—2, 10 x 7 x 24, Warren vertical duplex.
Oil feed—2, 6 x 3½ x 6, Warren hor. duplex.
Fresh water—1, 5¼ x 4¾ x 5, Warren vertical duplex.
Brine pumps—2, 4½ x 3¾ x 4, Warren vertical duplex.
Ice water—3, 4½ x 2¾ x 4, Warren vertical duplex.
Hot water—1.

Refrigerating Machinery:
1 Remington five-ton unit.
3 Warren duplex pumps.

Electric Equipment:
Generators, 2 sets of 15 K.W., General Electric.
Emergency, battery.

Refrigerated Space

Compartment:	Cu. Ft.
Ship's stores, restaurant stores, refreshment booth (cabinets, etc.), soda fountains.	

Fuel Oil Bunkers

Compartment:	Cu. Ft.	Tons	Gallons
Forward port	406	10.6	2,972
Forward starboard	406	10.6	2,972
After port	406	10.6	2,972
After starboard	406	10.6	2,972

Peak Tanks and Deep Tanks

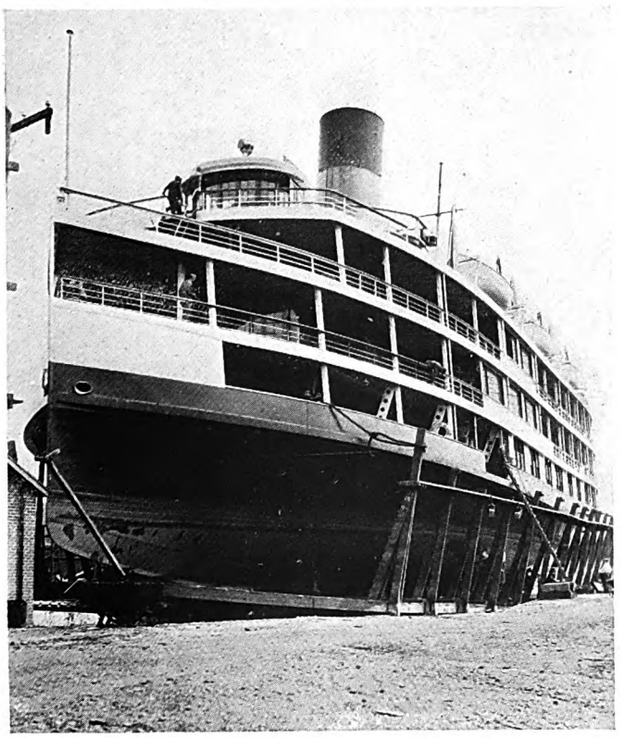
	Cu. Ft.	Tons F.W.
Fore peak	720	20
After peak	397	Dry
Deep tanks	648	18
Deep tanks	792	22

and is insulated to the height of the observation deck. The engine room is open, having a steel casing around the hatch extending to a height of about three feet above deck.

The hull below the main deck is subdivided by five transverse steel bulkheads into six watertight compartments as follows: Fore peak, forward compartment, boiler room, engine room, after compartment and after peak. The fore peak is arranged for the carriage of reserve feed water.

CREW

In the forward compartment on the lower deck is arranged the kitchen, pantry, ships' provision and refrigerated



Bow View of S. S. State of Delaware in Dry Dock

Stern View of S. S. State of Delaware in Dry Dock

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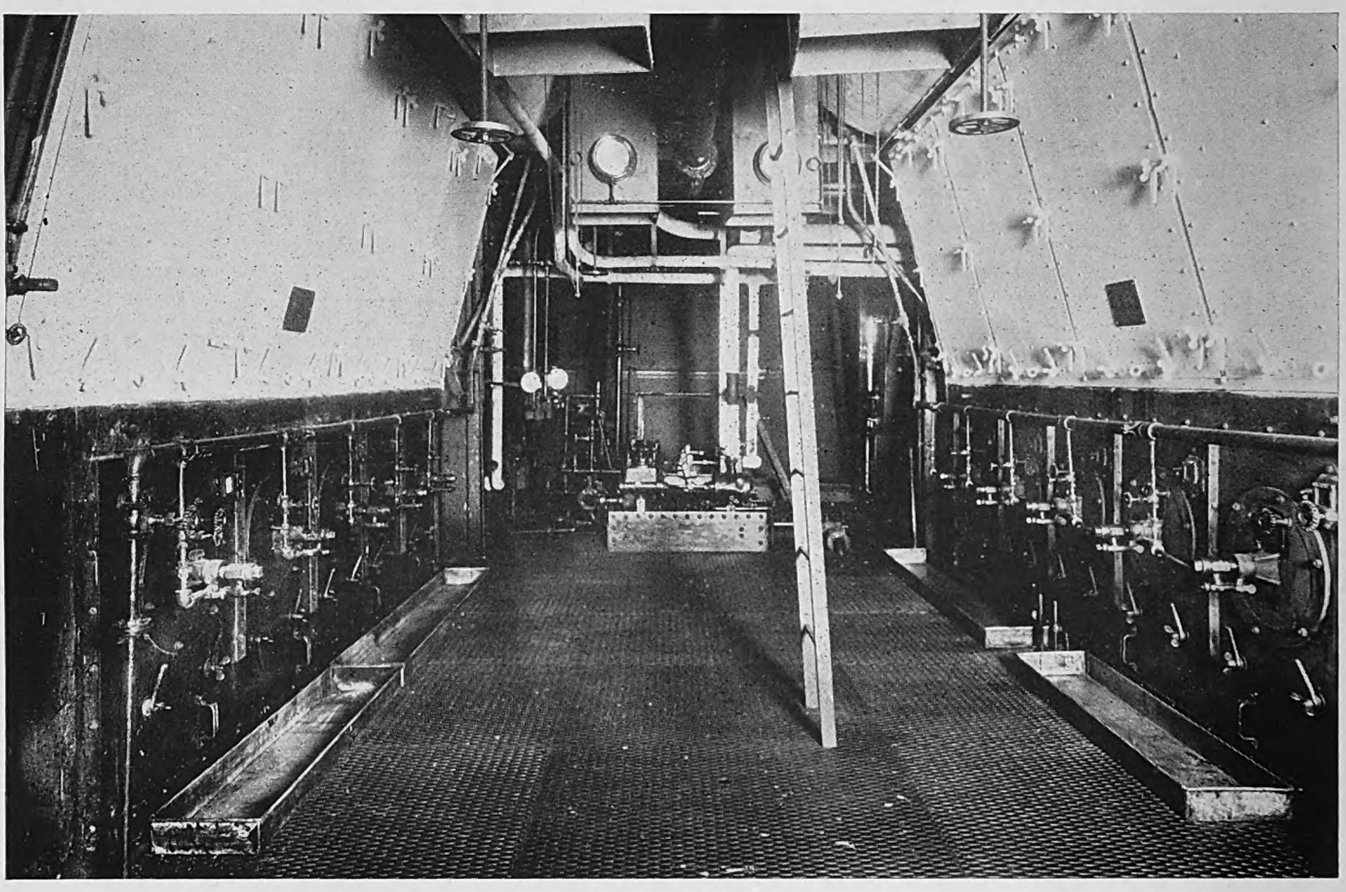
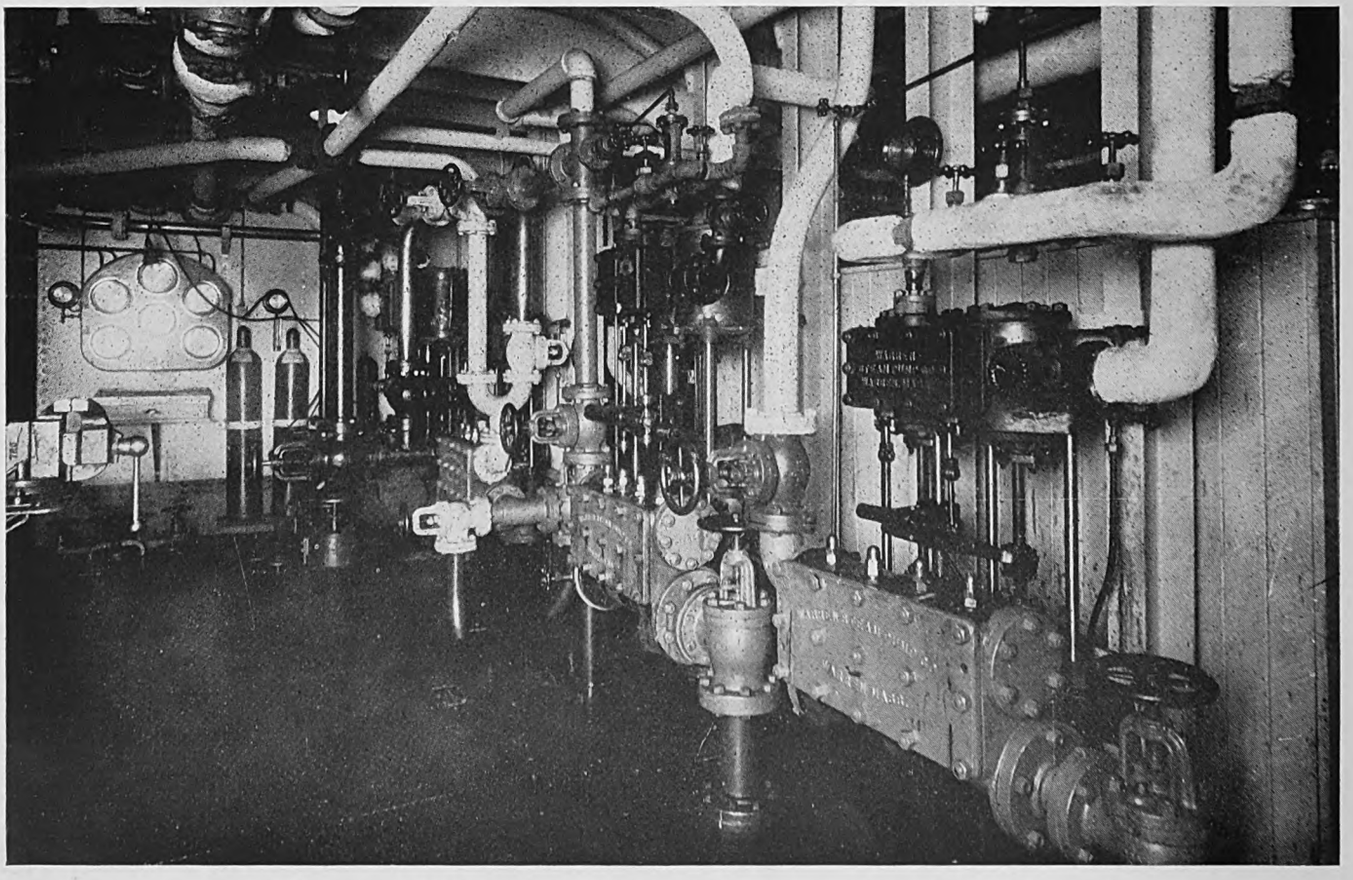


Boiler Room



View in Engine Room Showing Fresh Water, Sanitary, Bilge and Fire Pumps

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Observation Deck, Looking Aft

View on Saloon Deck Showing Dance Floor

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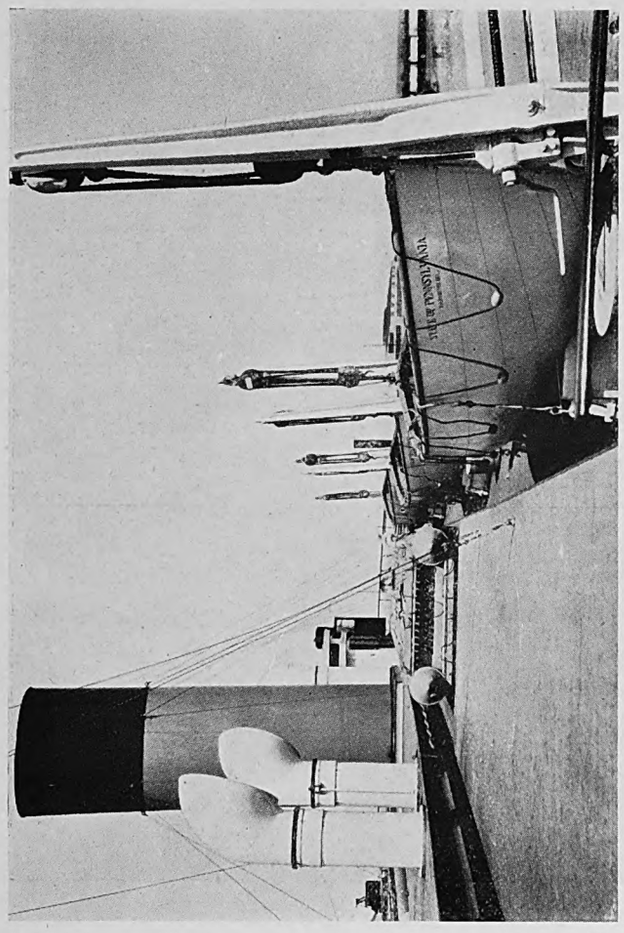
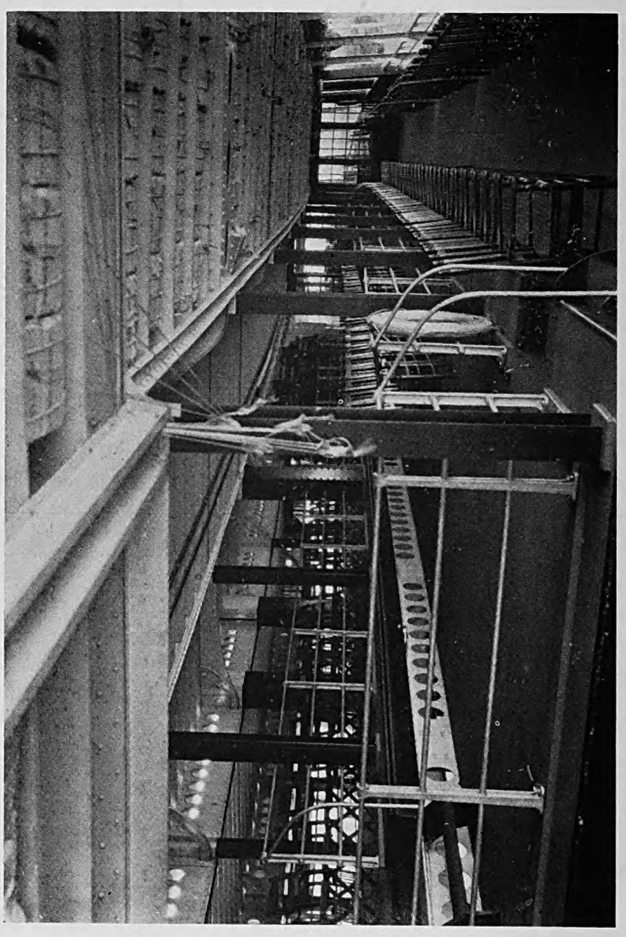
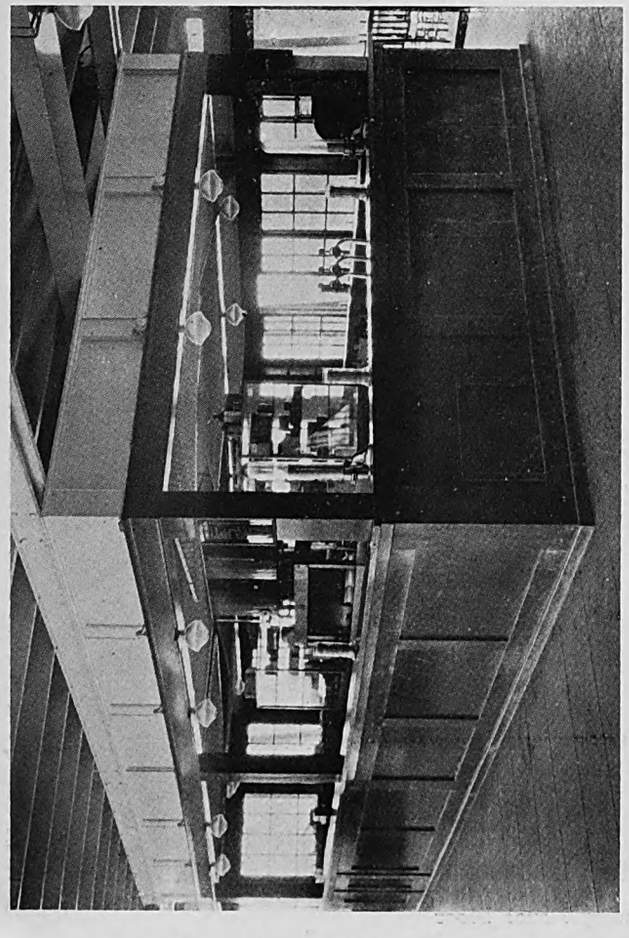


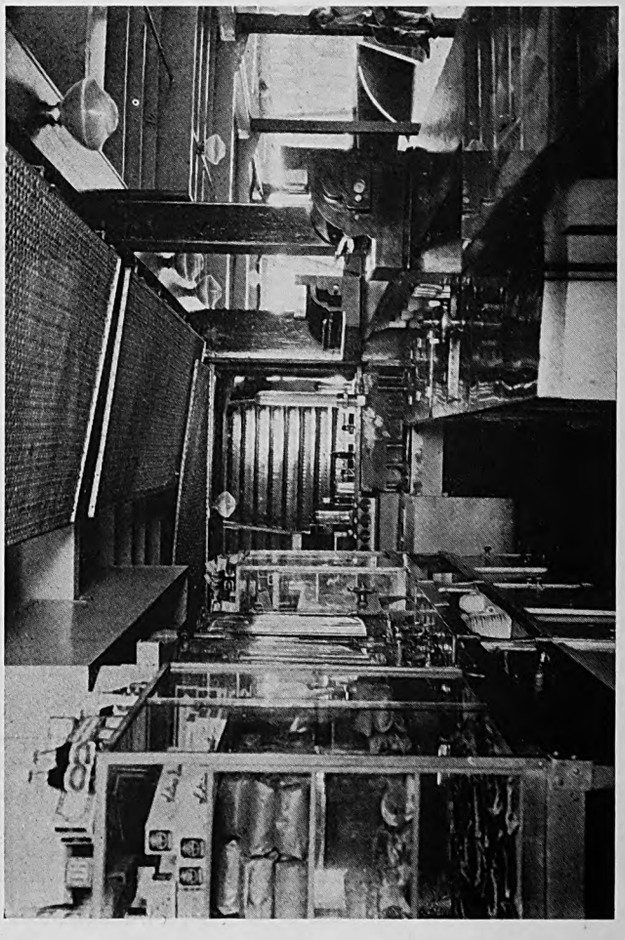
Boat Deck



Observation Deck, Looking Forward



Refreshment Booth on Saloon Deck



Interior of Refreshment Booth on Main Deck

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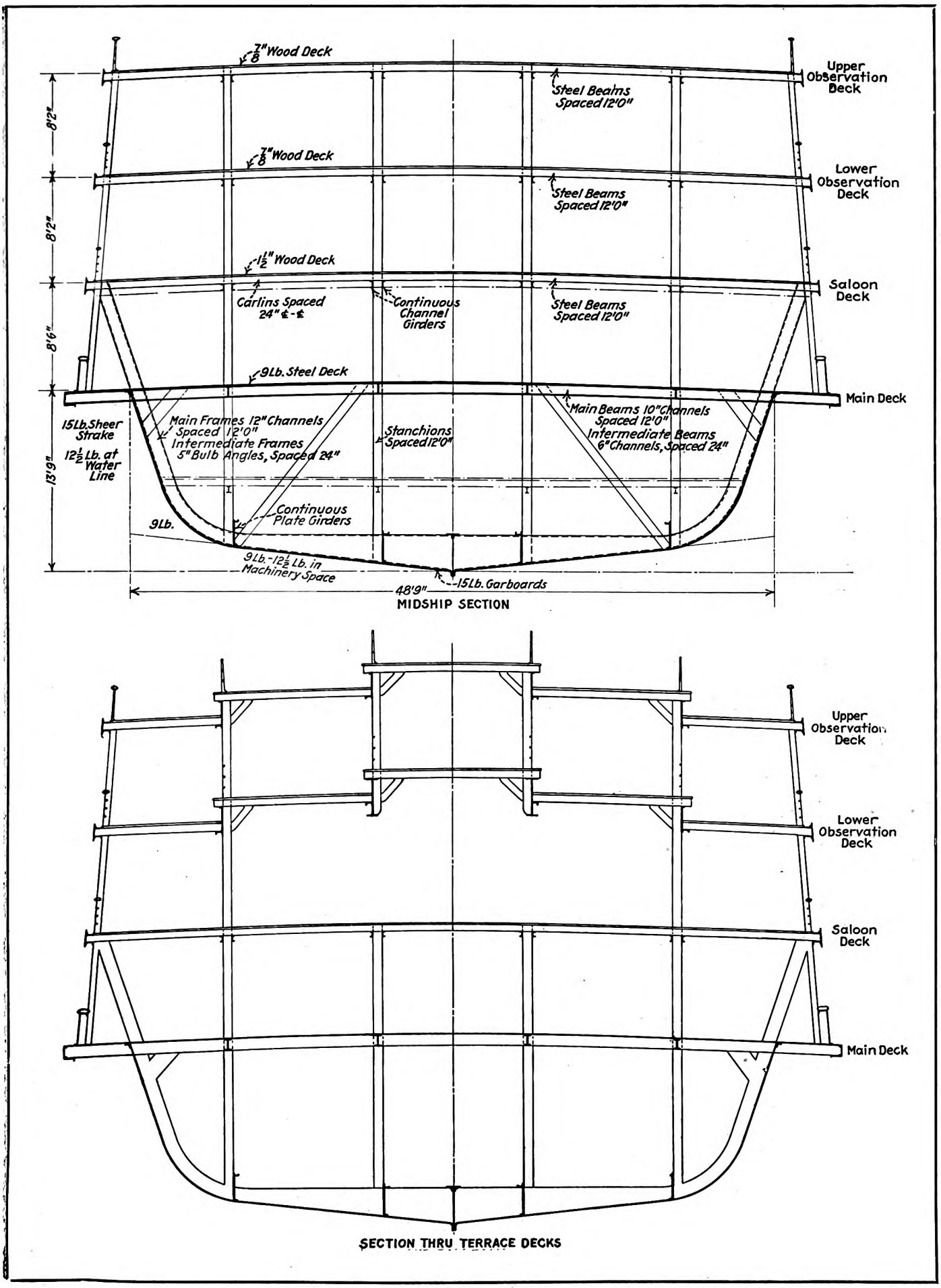

Midship Section and Section Through Terrace Decks

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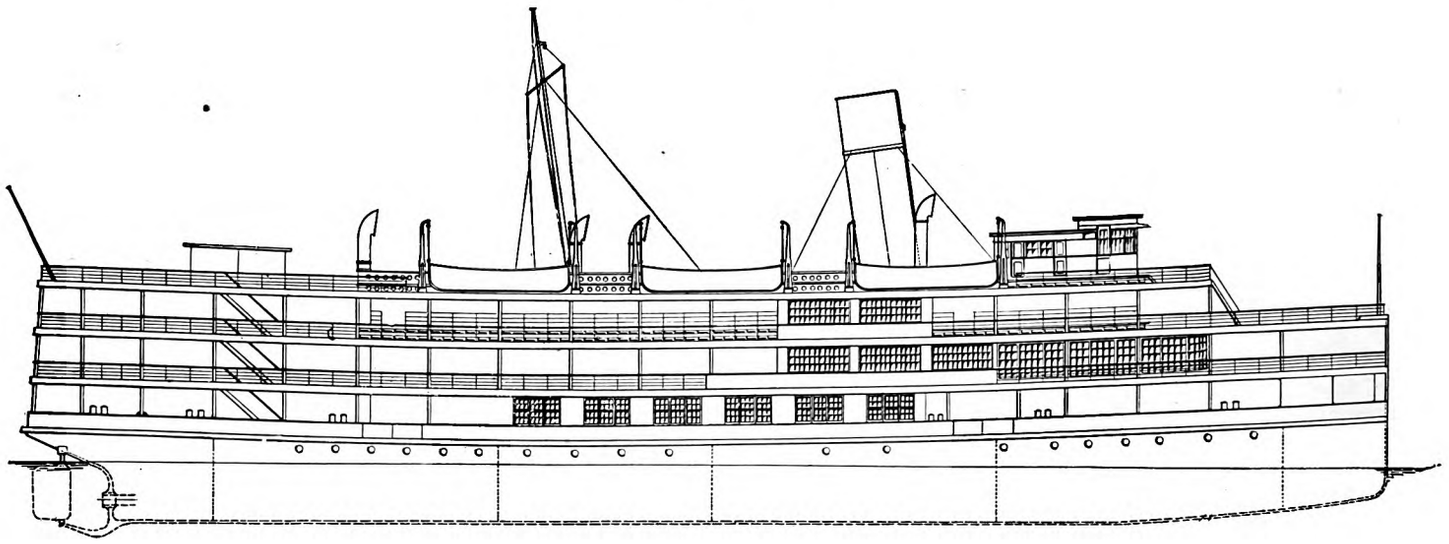
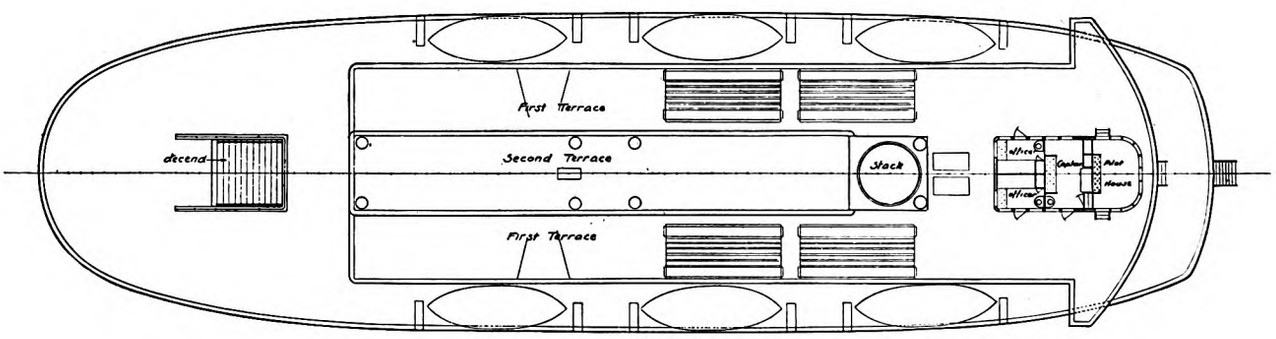
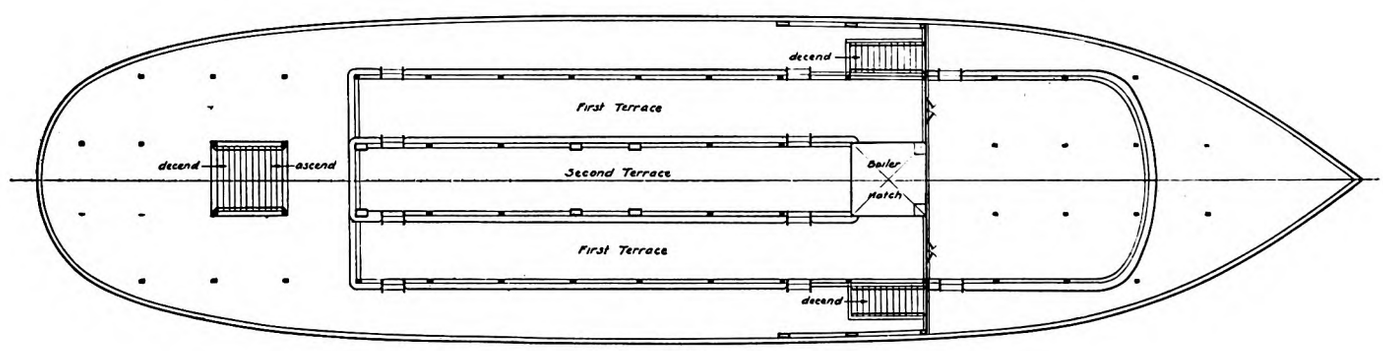
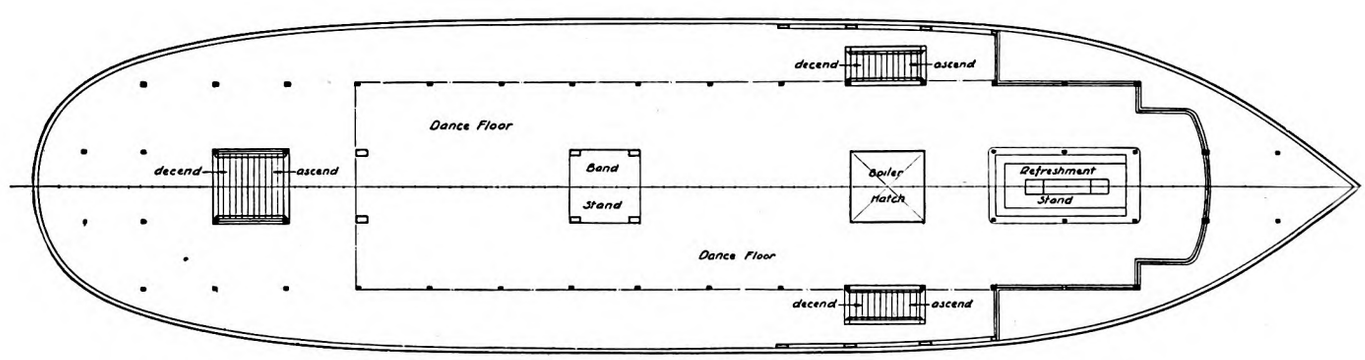




BOAT DECK



OBSERVATION DECK



SALOON DECK

General Arrangement Plans of New Wilson Line Excursion Steamers

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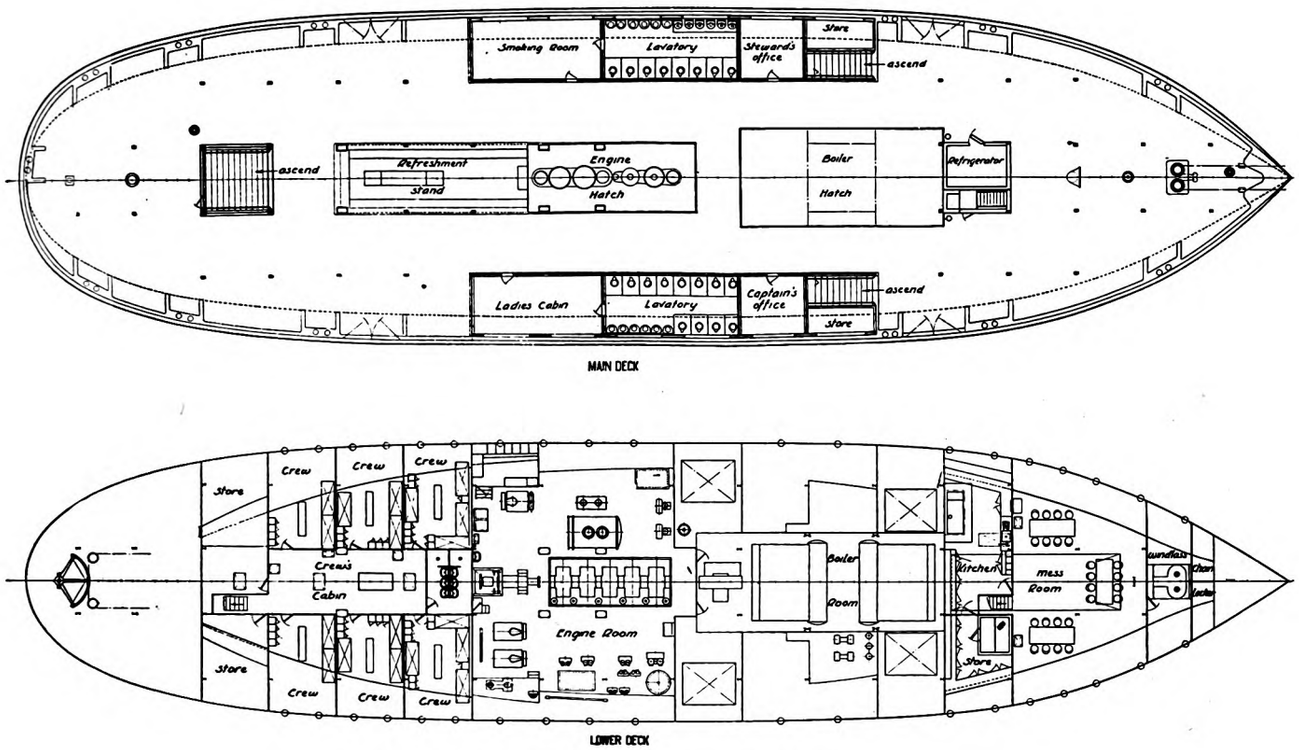
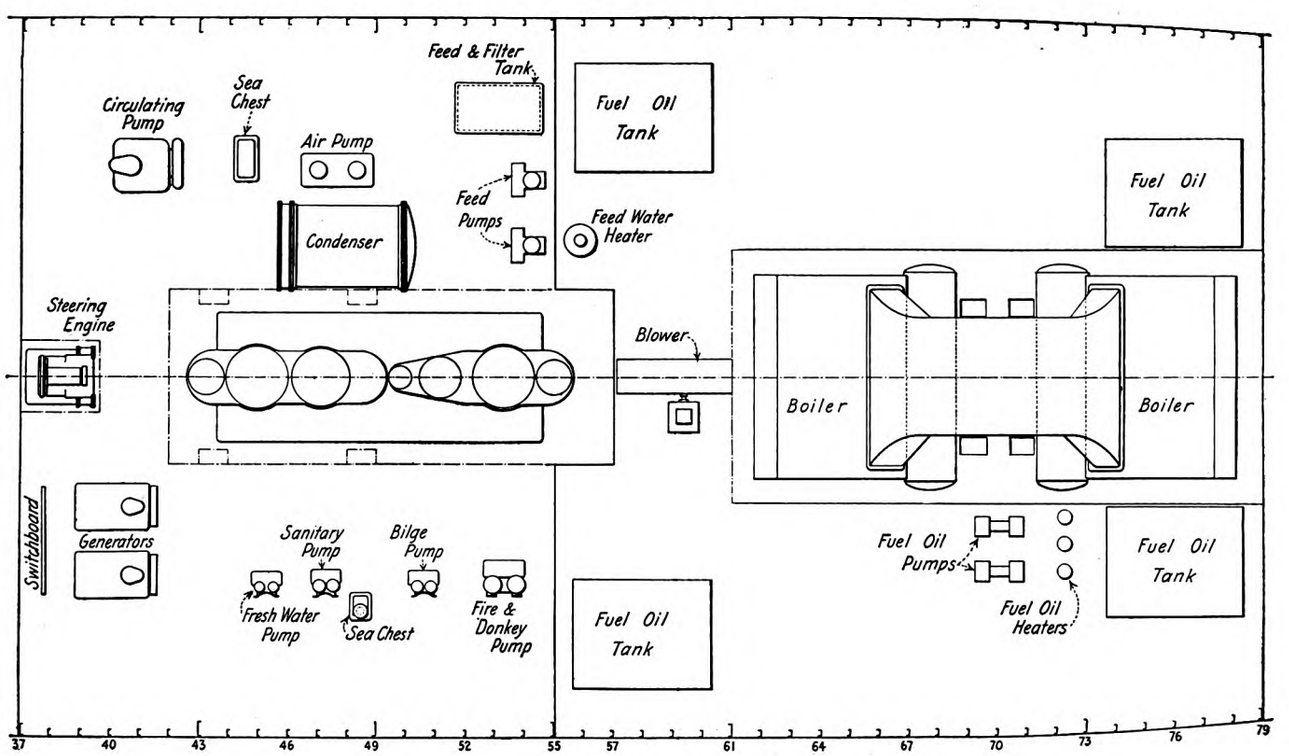


Plans of Main and Lower Decks

rooms and mess room, while below the lower deck are the culinary fresh water tanks. In the compartment abaft the machinery space, accommodation is provided for the engine, deck and steward's department crew.

Above the main deck, with the exception of space occupied by the pilot house, officers' quarters and life-saving appliances on the boat deck, the remainder of the vessel is arranged for the accommodation of the passengers, 3,500 being the complement. There are four decks in all, viz.: main, saloon, observation and boat decks. Ample seating capacity and comfortable deck space is provided for all passengers and terraced observation decks ensure a perfect view, light



Enlarged Plan of Machinery Space

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and ventilation for everyone on board regardless of their location.

With the exception of enclosures around the forward stairways and the refreshment booth on the saloon deck the sides are all open and fitted with rails only. Protection from the weather, when necessary, is provided by means of canvas drop weather screens fitted completely around the vessels.

The central portion of the saloon deck is reserved for dancing. The floor is approximately 35 feet by 90 feet without obstruction of any kind other than a bandstand, which is centrally located. The terraced decks over this part of the vessel give additional height which is about 12 feet at the center and 10 feet at the sides.

Refreshment Booths

At the forward end of the saloon deck there is a large refreshment booth enclosed, along with forward stairways, within a glass weather screen, while on the main deck aft a similar refreshment booth is fitted. The furnishing of these booths is most complete, and their 165 feet of serving counter provides adequately for the passengers' service without the attendant discomfort so frequently experienced due to crowding and delay.

At the forward end of each booth are plate glass and mahogany display cases fitted flush with the sides of the booth and blending with the mahogany sides and serving counter of the booth proper.

Steering, Navigating and Handling Appliances

Steering.—A partly balanced rudder of the double plate type is fitted with an extension stock carried to the boat deck where an emergency steering gear has been arranged for controlling the tiller through tackle connected to a drum operated by a hand steering wheel. The main quadrant is fitted on the rudder stock at the under side of the main deck having direct leads to the steering engine in the after engine room by means of rods and chains. The steering engine is operated by a wheel in the pilot house through the usual mechanical shaft control which is carried along the boat deck and down the engine room ventilator to the steering engine. The steering engine is of the American Engineering Company's 6-inch by 6-inch, two-cylinder, steam-driven drum type.

Windlass and Anchors.—The windlass, which is located on the main deck, is of the double vertical type driven electrically by a 7½ horsepower, 125 volt, direct current, General Electric motor through spur and worm gearing. The motor and gearing are mounted on the same bedplate on the deck below and drive the two wildcats and capstan on the deck above through vertical shafts.

There are two stockless anchors of 1,050 pounds each housed on bevelled skids ready for release and 90 fathoms of 1 1/16-inch stud link cable.

Capstan.—There is an electrically driven capstan on the main deck aft actuated through spur and worm gearing by a 7½ horsepower, 125 volt direct current General Electric motor. The motor and gearing are on one bedplate attached to the underside of the main deck driving the capstan barrel above through a vertical shaft.

Mooring Bitts.—There are six mooring bitts on each side and one on the center line aft, making thirteen in all. These are of a special type made of bronze and mounted on top of the bulwark rail.

Signal Mast.—A signal mast is fitted amidship, carrying a signal yard and range light. A head light is fitted on the stem head with the port and starboard running lights at the sides of the navigating bridge.

Communication.—Communication to the engine room is by the usual inland mechanical bell system. Communication by speaking tube with mechanical call bells is also provided from the pilot house to the engine room.

Appliances for Safety and Life Saving

Subdivision.—The main hull is divided transversely into six watertight compartments, there being five complete steel watertight bulkheads to the height of the main deck and two steel longitudinal watertight bulkheads from the top of the floor level to the lower deck, forming deep tanks for fresh water.

Life Saving.—On the boat deck there are six 24-foot metallic lifeboats and four large life rafts, with a working boat on the main deck forward. The lifeboat capacity is considerably in excess of the requirements of the service and Steward patent mechanical davits have been installed to insure prompt and efficient handling of the lifeboats in an emergency.

Life preservers are supplied for all on board. These are stowed between the beams on the under sides of the three upper decks along the sides of the vessel and are capable of being instantly released in an emergency. Cords are run fore and after through the beams and suitably spaced to provide two cords for the support of each row of life preservers. At the end of each row these cords are brought together and made fast on cleats so that by releasing the cords any row or rows of preservers instantly fall to the deck.

There are also stowed in convenient locations twelve cork ring life buoys, six of which are of the self-igniting luminous type.

Fire Prevention.—In the matter of fire prevention every precaution has been taken by the use of fire resisting materials eliminating wood as far as practicable. The whole superstructure is framed completely in steel. The main deck along with the machinery and boiler casings is completely of steel while the cabin enclosures and their internal bulkheads are constructed of Plymetal as manufactured by the Haskelite Corporation. There are several types of Plymetal, but that used on these vessels is of the double-faced type, which is a combination of Plywood and steel composed of a three-ply panel to which is added two faces of thin double galvanized stretcher leveled sheet steel.

While every effort has been made in the construction of these vessels to make them fire resisting, the most modern and effective means of fire fighting have been adopted to meet any emergency. In addition to the regular water fire system with outlets and hose at suitable points throughout the vessel a number of patent tanks have been installed, each containing water or a chemical supply for the first six fire buckets contained therein.

A further precaution has been taken by the installation of a Foamite hose pressure system in these vessels. The system consists of two riveted steel tanks, having a capacity of 300 gallons of solution each, from which separate pipes are led to Foamite hose stations located on the starboard side of the boiler room, on the forward bulkhead on the starboard side of the engine room and on the bulkhead of the boiler casing on the main deck. The solutions are expelled from the tanks by nitrogen under a pressure of 40 pounds per square inch. Seamless drawn steel cylinders are used as containers to hold this nitrogen at a pressure of 2,000 pounds per square inch. The cylinders are connected by means of flexible couplings to a high pressure manifold located in the engine room near the fireroom entrance door and the main control valve for the operation of the system is installed at this manifold. Gages are fitted to both the high pressure and the low pressure sides of the manifold, as well as on each solution storage tank. An arrangement of valves has been provided, so that the system may be readily flushed out with water and charged after it has been used.

Refrigerating Plant

The refrigerating plant consists of the following:

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1 Remington Machine Company 5-ton unit compressor, having cylinders 4¼ inches diameter by 9 inches stroke, the engine having a diameter of 7 inches and a stroke of 7 inches. Both the engine and compressor are on the same base.
1 Liquid ammonia receiver.
1 Ammonia condenser 12 feet long by 19 pipes high.
2 Warren duplex vertical steam pumps, each 4½ inches by 3¾ inches by 4 inches for circulating drinking water.
1 Warren duplex vertical steam pump, 4½ inches by 2¾ inches by 4 inches for circulating water through the ammonia condenser, the sanitary pump being connected for use as emergency.
1 Brine tank with direct expansion coils of 500 gallons capacity.
1 Scuttle butt for drinking water, with direct expansion coils of 400 gallons capacity. A water spray system over the ammonia parts is installed with a distant valve control for use in case of emergency.

The refrigerating plant takes care of the soda fountain and soft drink cabinets in both refreshment booths, an ice cream cabinet having a capacity for fourteen five-gallon reserve ice cream containers, the refrigerator for cold storage on the main deck forward and the refrigerator for steward's supplies adjoining the galley, in addition to drinking water which is obtainable from six fountains other than those at the refreshment booths and from faucets in the galley and engine room.

Ventilation

Ventilation is provided for the mess room, kitchen and store rooms forward by three ventilators through the main deck with an exhaust ventilator from the galley carried into the stack casing. The crew's quarters aft receive their supply of fresh air through large cowl ventilators on the boat deck carried through trunks. The lavatories have exhaust ventilators led into the fan casing in the boiler room. A constant supply of fresh air to the various rooms contained in the main deck enclosures, port and starboard, is provided through shielded grills above the windows when these are closed. The canopy over the forward refreshment booth has an exhaust duct which is led into the stack casing. There are four 24-inch diameter cowl ventilators to the engine room and two of 30 inches diameter to the boiler room.

Electric Equipment

The main generating equipment consists of two 15 kilowatt General Electric generators connected in parallel, though one generator has sufficient capacity for the normal load. The main switchboard is located in the engine room and has mounted upon it the necessary switches to control the dynamos, search light, running lights, power circuits for the deck machinery along with feeders to auxiliary lighting circuit panels. All the main feeders are of armored cable while the lighting circuits are either of armored cable or carried in metal conduits to suit the local conditions.

The fixtures generally are of the ceiling type with enclosed Holoplane globes which, in the more exposed places, are of the watertight type. The complete electric and communicating equipment installation was carried out by Charles Cory and Son, Inc., New York.

Propelling Machinery

The main engine is of the four cylinder, triple expansion, direct acting surface condensing type with cylinders 24, 37¾, 44 and 44 inches diameter by 30 inches stroke, designed for a working pressure of 200 pounds per square inch and developing 2,900 horsepower at 155 revolutions per minute with independent condenser and pumps. The thrust bearing is of the Kingsbury type.

Boilers

Each vessel is equipped with two Babcock and Wilcox marine watertube boilers each having 3,739 square feet of heating surface, or a total of 7,478 square feet, with furnaces arranged for oil fuel. The boilers are 23 sections wide, each section having 7½ clusters of four 2-inch tubes, with one 4-inch tube over the furnace, the tubes being 9 feet long.

Each boiler is equipped with five Babcock and Wilcox mechanical atomizing oil burners, Buyama design, arranged to operate under forced draft. The blower delivers the necessary air to the duct surrounding the oil burners, formed by the inner and outer front plates of the boiler, the outer front plate being so designed that the burners can be operated with natural draft, if necessary.

Coen three unit 12 by 50 steel construction cleanable oil heaters of the latest design have been installed. With these heaters the oil passes between an inner and outer element, and there are no coils, the absence of which is one of the noteworthy improvements in this heater, permitting of cleaning with the least amount of trouble and delay.

The fuel oil strainers for both the suction and discharge side are the Coen duplex type, with double baskets which have a combined area approximately eight times the cross sectional area of the pipe. A single 90-degree turn of the handle changes from one basket to the other basket allowing the strainer to be cleaned while the burners are in operation.

Forced Draft System

Each ship is equipped with one 78-inch double inlet Howden forced draft fan driven by one 7-inch by 5-inch Howden enclosed forced lubrication engine.

The fan units are situated in the boiler room just aft of the boilers and deliver the air into ducts passing below the boilers. The boiler fronts are so arranged that, by moving dampers, the furnaces will be supplied with air either under natural draft alone, with natural draft assisted by forced draft or entirely by forced draft.

Owing to the solid central plate construction of the Howden fan it has been possible to use one inlet of the fan to ventilate the lavatories, etc., in the upper part of the ship, the other inlet taking the warm air from the engine and boiler rooms. Running on forced draft, the fan units, which are somewhat larger than necessary, are capable of running the boilers at high rating, thus giving a reserve which can be called on in emergency.

Auxiliaries

There are two 10-inch by 7-inch by 24-inch vertical single main feed pumps operating against a working pressure of 210 pounds per square inch in the boilers. The pump ends are of cast iron heavily brass lined and brass fitted and are of the valve pot type in which the entire valve service is readily removed for inspection or repairs. The steam valve gear is of the well known Warren "Eclipse" type in which the main slide valve is mechanically operated instead of entirely steam thrown.

The feed water is heated by a Reilly type G, number 16 marine feed water heater.

There is one 10-inch by 22-inch by 15-inch main air pump of the vertical twin single-acting type having cast iron pump cylinders, brass lined and brass fitted. The head and foot valve decks are of brass as well as the pump buckets. The pump valves are of the multi-disk phosphor bronze type. Ample size handhole plates are provided in the suction and discharge chambers and also in the plunger barrels to permit of easy access to all valves.

The circulating pump, supplied by the Pusey & Jones Company, has a 12-inch suction and 10-inch discharge and is direct connected to a 9-inch by 9-inch Engberg vertical engine.

There is one 6-inch by 6-inch by 6-inch Warren vertical duplex piston pattern bilge pump having cast iron pump cylinders fully brass fitted. The pump cylinders are designed for 150 pounds per square inch pressure.

There is one 10-inch by 7-inch by 12-inch vertical duplex

(*Continued on page* 569)

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Great Lakes Freighter Frontenac

Latest Addition to the Fleet of Lake Freighters Has Many Features, Including a Special System of Ballast Tanks and Pumping Arrangements

ON May 26 the 12,000 deadweight ton freight steamer *Frontenac* was launched at the River Rouge (Michigan) yards of the Great Lakes Engineering Works. This vessel which is to be used as a freight steamer was subsequently delivered to the owners, the Cleveland-Cliffs Steamship Company, Cleveland, Ohio, on July 28.

Since freighters in Lake service run rather to standard types, the improvements in design, construction and equipment in the case of the *Frontenac* have been more or less in minor details—the greatest innovation being in the construction of the ballast tanks and the method of equipment for handling the water ballast. Details of the system are given in a later section of the article.

The principal dimensions of the vessel are as follows:

Length overall	605 feet
Length on keel	580 feet
Beam, molded	60 feet
Depth, molded	32 feet
Deadweight carrying capacity at 20-foot draft, about	12,000 long tons
Water ballast capacity	6,700 long tons
Gross tonnage	8,158
Net tonnage	6,531
Service speed about	12 knots

Type of Construction

The hull is of arch girder construction with a forecastle deck and pilot house forward. The machinery spaces are located aft and here also are the coal bunkers and ship supply tonnage.

The cargo hold is divided into four compartments. The cargo hatches numbering eighteen in all are 38 feet wide, 12 feet long fore and aft and are spaced 24 feet on centers. The hatch covers are of the steel telescopic type, fitted with Mulholland fasteners and operated by wire cables which are led along the deck with portable posts and fixed cleats to the steam deck engines amidships.

Water ballast is carried in both the side and bottom tanks, the side tanks being separate from the bottom tanks.

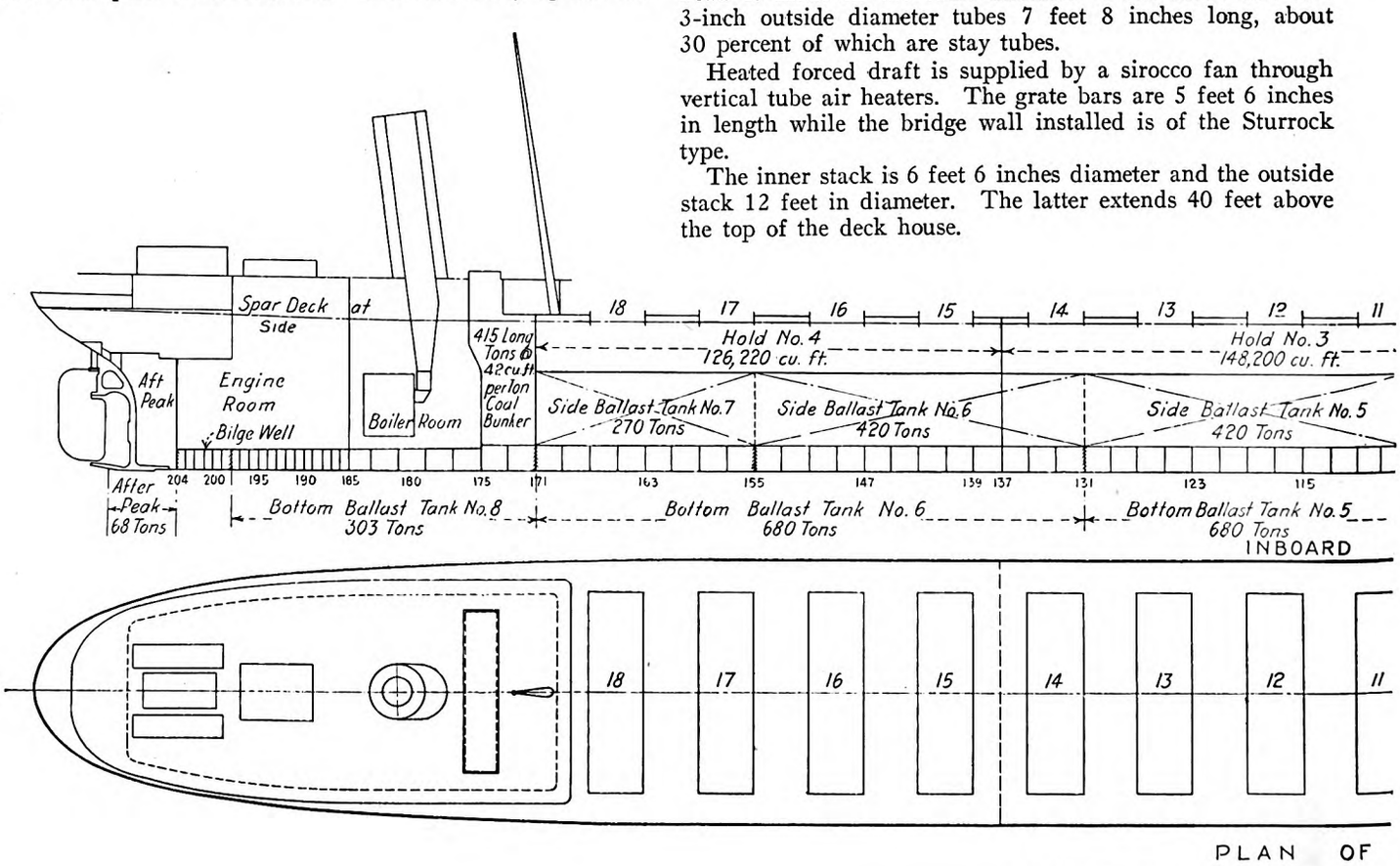
Details of Propelling Machinery

Steam for the propelling machinery and auxiliaries is supplied by three Scotch boilers 13 feet 6 inches diameter by 11 feet 3 inches long, constructed to pass the requirements of the United States Bureau of Steamboat Inspection and of the American Bureau of Shipping, for a working pressure of 180 pounds per square inch. Each boiler has two corrugated furnaces 50 inches inside diameter and each furnace a separate combustion chamber.

The boiler shell is rolled from a single plate and has two longitudinal joints with double butt straps of equal width. The circumferential end seams are double riveted. The front head is made from a single plate 1⅛ inches thick, eliminating all doublers and horizontal joints. The back head is made in the same manner. Each boiler has 294 3-inch outside diameter tubes 7 feet 8 inches long, about 30 percent of which are stay tubes.

Heated forced draft is supplied by a sirocco fan through vertical tube air heaters. The grate bars are 5 feet 6 inches in length while the bridge wall installed is of the Sturrock type.

The inner stack is 6 feet 6 inches diameter and the outside stack 12 feet in diameter. The latter extends 40 feet above the top of the deck house.


Spar Deck at Side
Aft Peak
Engine Room
Bilge Well
Boiler Room
415 Long Tons @ 42 cu ft per ton Coal Bunker
18 17 16 15 14 13 12 11
Hold No. 4 126,220 cu. ft.
Hold No. 3 148,200 cu. ft.
Side Ballast Tank No. 7 270 Tons
Side Ballast Tank No. 6 420 Tons
Side Ballast Tank No. 5 420 Tons
204 200 195 190 185 180 175 171 163 155 147 139 137 131 123 115
After Peak 68 Tons
Bottom Ballast Tank No. 8 303 Tons
Bottom Ballast Tank No. 6 680 Tons
Bottom Ballast Tank No. 5 680 Tons
INBOARD
18 17 16 15 14 13 12 11
PLAN OF

Inboard Profile and Spar Deck Plan

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Total heating surface—3 boilers..... 6,261 square feet
Total grate surface—3 boilers.....137.25 square feet
Ratio heating surface to grate surface..... 45.7 to 1
Air heater heating surface ..... 2,364 square feet

MAIN ENGINE

The main engine is a vertical triple expansion, three crank engine having cylinders 24½, 40 and 65 inches in diameter with a stroke of 42 inches. At 82 revolutions per minute normal speed this engine develops 1,900 indicated horsepower. The low pressure cylinder is placed at the forward end of the engine, the intermediate at the after end and the high pressure in the center with its valve chest on the outboard side of the cylinder. The high pressure valve is actuated through a rocker arm. This engine is about 18 inches less in overall length than an engine of equal size having cylinders and valve chests in line. The high pressure and intermediate pressure valves are of piston type and the low pressure valve is a double ported slide valve.

The high pressure and intermediate pressure piston have deep removable followers and the low pressure piston is fitted with one ring having flat springs fitted behind it. This ring is clamped between the follower and piston body making what is practically an adjustable plug piston.

The crosshead is of cast steel with brass shoes. The upper ends of the connecting rods are of the gib and key type with bronze boxes while the lower end has cast steel boxes lined with Ackermite bearing metal.

There are four front columns and three guide columns of box type all made of cast iron. The crank shaft is of the built-up type with cast steel slabs and is supported by four babbitt lined journals. All valves are operated by Stevenson link motion, the high pressure being operated through a rocker arm. The thrust bearing is of the ordinary horse shoe type.

The propeller is of cast iron, of the sectional type with four blades, having a diameter of 15 feet 0 inches, a pitch of 13 feet 9 inches and a developed area of 83 square feet.

AUXILIARY EQUIPMENT

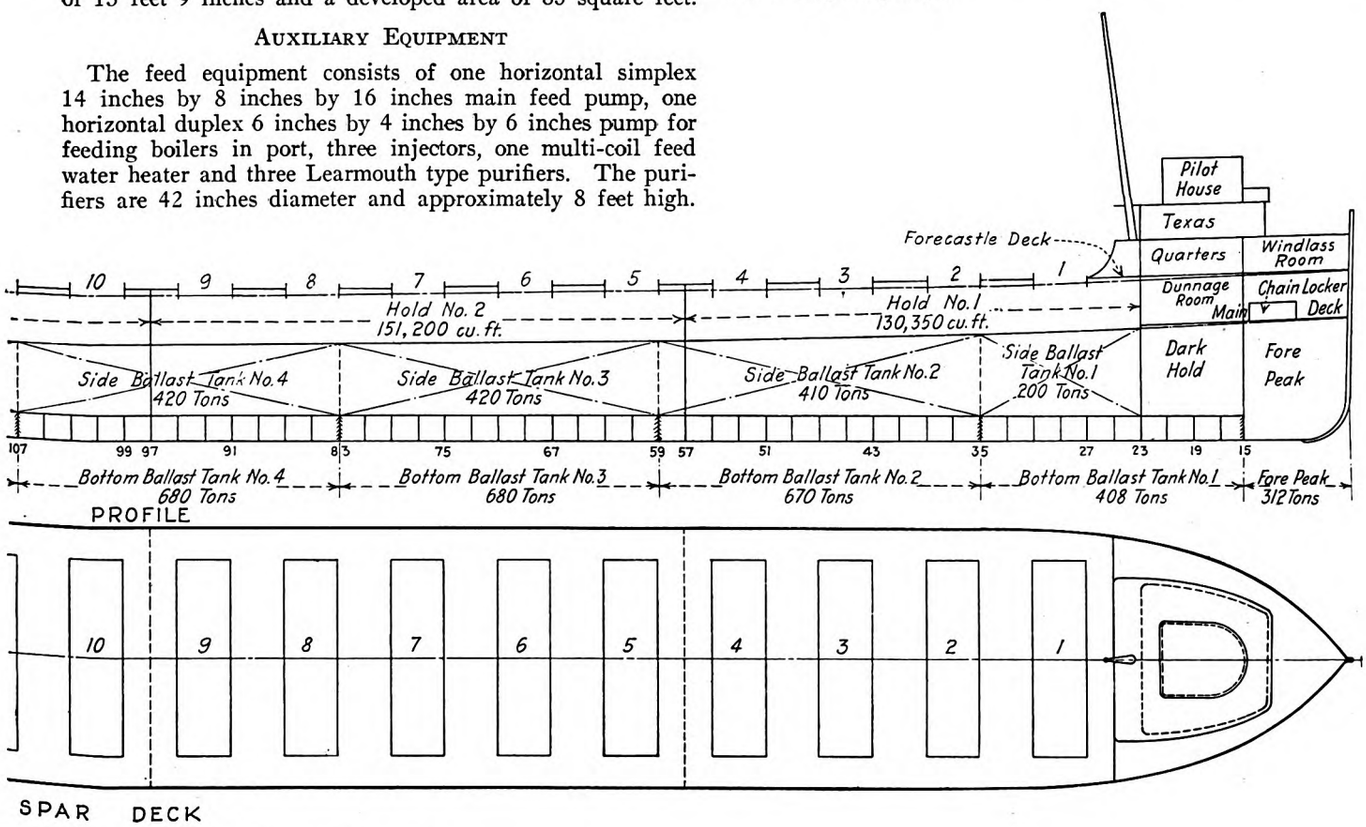
The feed equipment consists of one horizontal simplex 14 inches by 8 inches by 16 inches main feed pump, one horizontal duplex 6 inches by 4 inches by 6 inches pump for feeding boilers in port, three injectors, one multi-coil feed water heater and three Learmouth type purifiers. The purifiers are 42 inches diameter and approximately 8 feet high. Both top and bottom heads are of flanged steel. The entrance to the purifier is gained through a 12 inches by 16 inches manhole in the top head. Cleaning hand holes are also placed along the sides. The feed pumps take their suction from a feed tank installed in the engine room. The water supply for this tank is obtained from the discharge of the air pump and is augmented by the drains from the feed water heater and miscellaneous traps.

The general service pump is a 12 inches by 6 inches by 12 inches horizontal duplex and may be used for fire, feed and ash gun service. The mates' pump is a horizontal duplex 6 inches by 4 inches by 6 inches pump and is used for deck washing service. The sanitary pump is a horizontal duplex 6 inches by 4 inches by 6 inches pump. The main air pump is a vertical simplex combined air pump and jet condenser, size 18 inches by 36 inches by 24 inches.

The lighting equipment consists of two 15 kilowatt and one 10 kilowatt engine driven generators.

BALLAST SYSTEM

There are eight bottom ballast tanks divided at the centerline and seven port and seven starboard side tanks. The bottom tanks are piped through separate pipes in the double bottom to a double type manifold in the engine room, so that the tanks may be filled, emptied or water transferred from one tank to another at will. There is a fore and aft header on each side of the ship with connections to each side tank. Eight-inch angle shut-off valves, operated from the deck are placed at each tank. The piping system is so arranged in the engine room that the side tanks may be pumped full at the same time that the bottom tanks are being filled from the sea by gravity. This arrangement materially cuts down the time required for ballasting. The ballast pumps consist of two 14-inch centrifugal pumps of 6,000 gallons per minute capacity, and two 10 inches by 14 inches by 12 inches horizontal duplex pumps.



of New Great Lakes Freighter Frontenac

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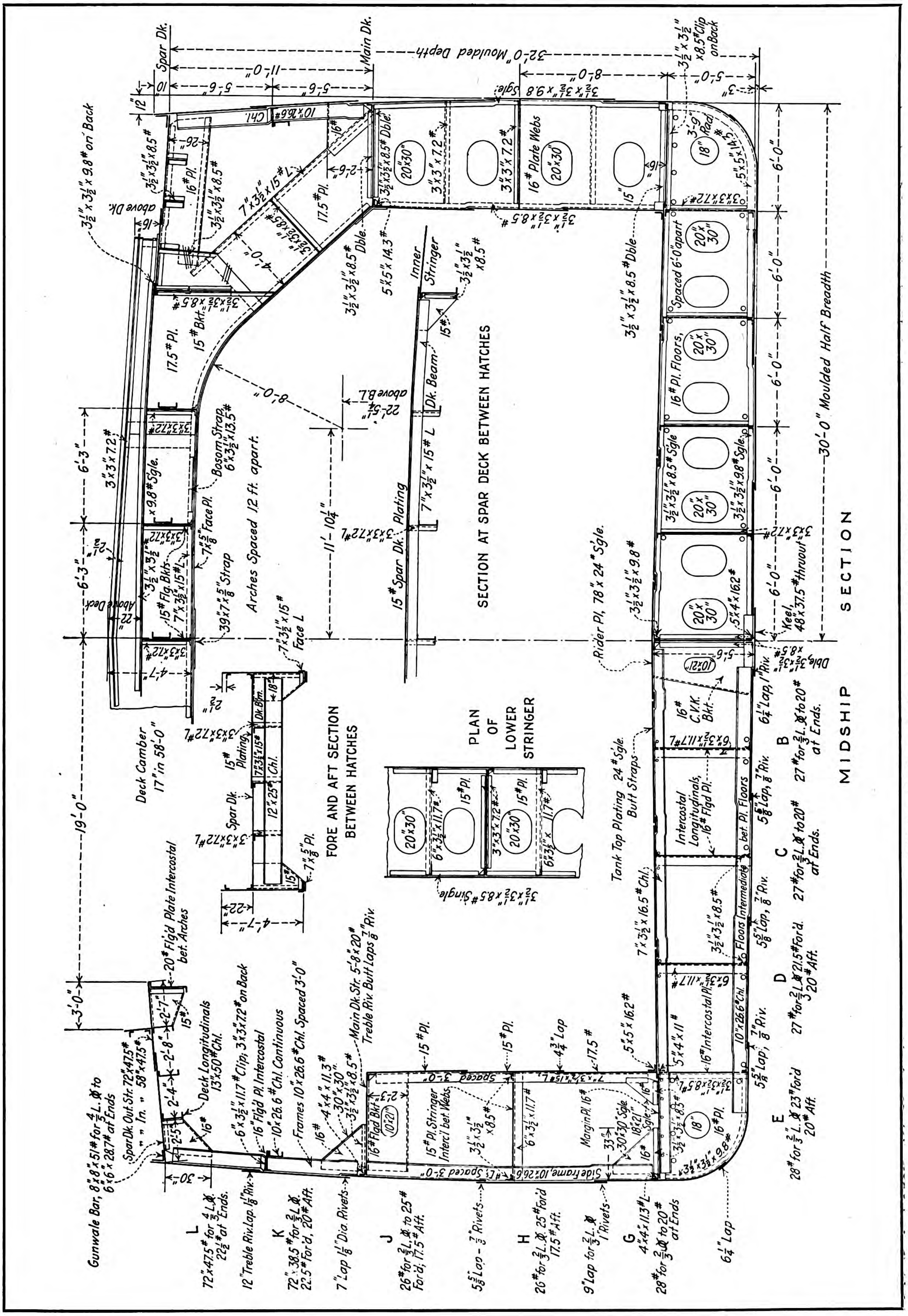
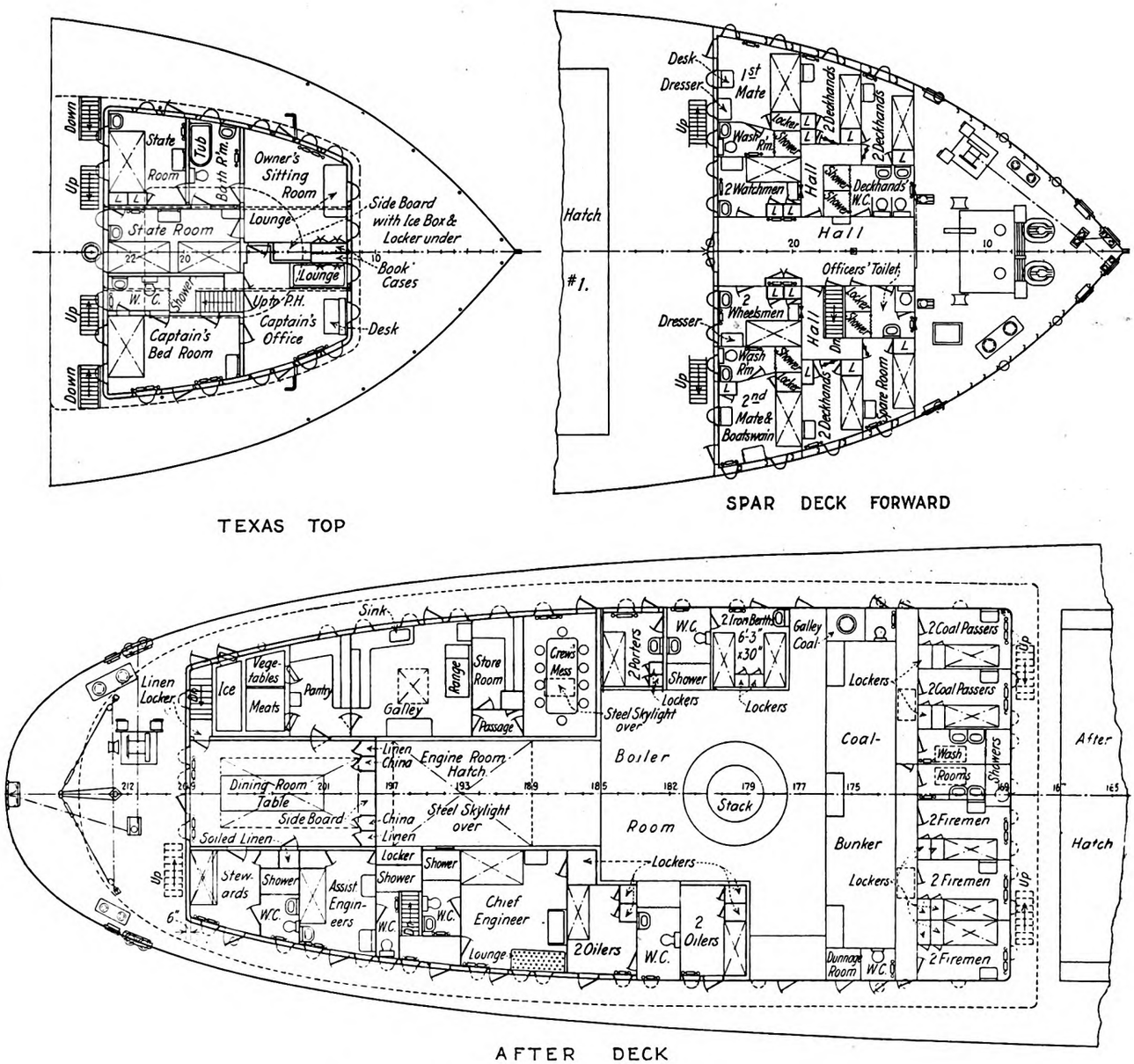


Midship Section of Great Lakes Freighter Frontenac



Accommodation Plans of the Freighter Frontenac

ACCOMMODATIONS

The propelling machinery, and commodious quarters for engineers, the steward's department, oilers, firemen and deckhands' are located in the after end of the ship. At the forward end is a sitting room and two staterooms for the owners, the captain's office and stateroom, pilot house, quarters for the mates, etc. The finish in the owners' staterooms is white enamel and the sitting room, dining room and officers' quarters are finished in oak.

Intercoastal Cargoes Increasing

THE Bureau of Research, United States Shipping Board, issued recently figures showing the movements of cargoes between the east and the west coasts of the United States for the first six months of 1923. The total cargo so moved amounted to 5,644,837 tons. Three-fourths of this movement was from the west coast to the east coast, and five-sevenths of this eastbound movement was composed of tank ship cargoes of petroleum. Leaving out the bulk oil traffic, 1,430,790 tons moved to the west coast, and 1,059,534 tons were brought to the eastward.

Los Angeles leads all the individual ports in quantity handled in this trade, her total being 3,727,240 tons against New York's 2,652,600. Los Angeles also stands first among the Pacific ports, both in eastbound and in westbound traffic, considered separately. On the Atlantic New York is foremost in amount of intercoastal cargo tonnage entered, while Baltimore leads in quantity cleared.

The rank of the first ten ports of the United States in intercoastal movement only—coastwise and foreign traffic not considered—is as follows, for the half-year: Los Angeles, 3,727,240; New York, 2,652,600; San Francisco, 795,987; Philadelphia, 749,354; Baltimore, 742,894; New Orleans, 332,261; Seattle, 263,141; Portland, Ore., 238,548; Boston, 223,649; Tacoma, 173,314.

To the already phenomenal growth of the intercoastal cargo trade there will undoubtedly be added a healthy gain to this route as to means of travel for passengers between the east and west coasts.

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Influence of the Bulbous Bow on Resistance

Results of Recent Investigations at Government Model Basin Showing Effect of Varying Bow Slope of Sectional Area Curves

By Rear-Admiral D. W. Taylor, U. S. N. (Retired)*

FOR nearly twenty years the battleships of the United States Navy have been designed with bulbous bows because in the early days of the Model Basin at Washington searching for improvement in form we concluded that the bulbous bow, uncouth as it appeared, served to reduce battleship resistance. The bulbous bow was not altogether the result of hit or miss methods. Somewhere in the literature of ship resistance I had seen reference (by Mr. William Froude, I believe) to a so-called swan model having full but narrow water lines close to the bow succeeded by an almost parallel section which was followed again by lines swelling out to a normal form. The theory seemed to be to have first a false bow as it were, corresponding to a small ship. This would create a small bow wave and in its hollow was located the second or true bow, making a second bow wave that would neutralize the first.

We were never able to make a swan model that drove more easily than the usual form but the bulbous bow rather grew out of this research. Its idea was to fine the water line as much as possible and put the displacement removed from the vicinity of the water line as far below water as possible.

So instead of a fine bow forward with a second full bow abaft it we had a fine bow at the water line as it were and a full bow near the keel.

Bulbous Bow not Patented

No attempt was made to patent the form or keep it confidential. In "Speed and Power of Ships," published in 1910, the Standard Series lines, the basic lines for a large number of models used to investigate variation of resistance with variation of size, proportions and longitudinal fullness, were shown with a moderate bulbous bow. Concerning the bulbous bow I said in "Speed and Power," pages 93 and 94:

"It may be pointed out that experiments show a ram bow of bulbous type to be favorable to speed, even apart from the fact that the ram bow usually involves a slight increase in effective length. This is simply because the ram bow, which is the extreme case of the U bow, is much fuller below water than at the water line. The excess pressures set up around the ram being well below the surface are more absorbed in pumping the water aft, where it is needed and less absorbed in raising the surface and producing waves than if the same displacement were brought close to the surface."

So far as I know only one merchant vessel has ever been built with a bulbous bow and I am not sure that the venturesome marine superintendent who took a chance on it concluded that he had gained a faster ship by its use.

Recent Tests at Government Model Basin

We never made a thorough investigation of this bulbous bow matter during my time at the Model Basin. While it was kept in mind as one of the jobs to be taken up when a slack time came, somehow the slack time seemed never to come. But Captain Eggert, now in charge of the Model Basin, has recently finished some extensive tests in the field where I made a small beginning years ago and the results seemed so interesting to the naval architect that I sought and obtained permission of Admiral Beuret—the Chief Constructor of the Navy—to write them up. They throw much light not only upon the bulbous bow question but also upon an allied question of importance—namely, the effect upon

*Former Chief Constructor, United States Navy.

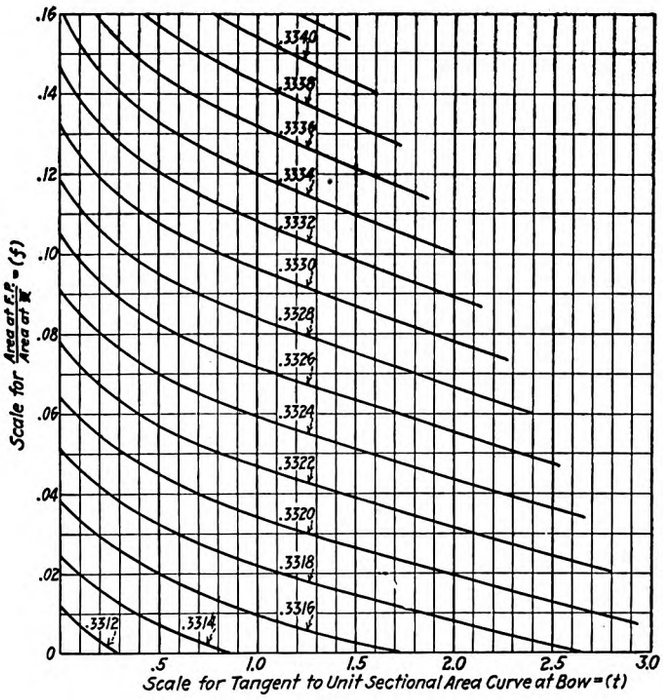

Fig. 1.—Series A. Contours of Wetted Surface Coefficients = C. W.S. = C $\sqrt{P \times L}$, Where P = Displacement of Model in Pounds and L = Length in Feet (P is for Fresh Water)

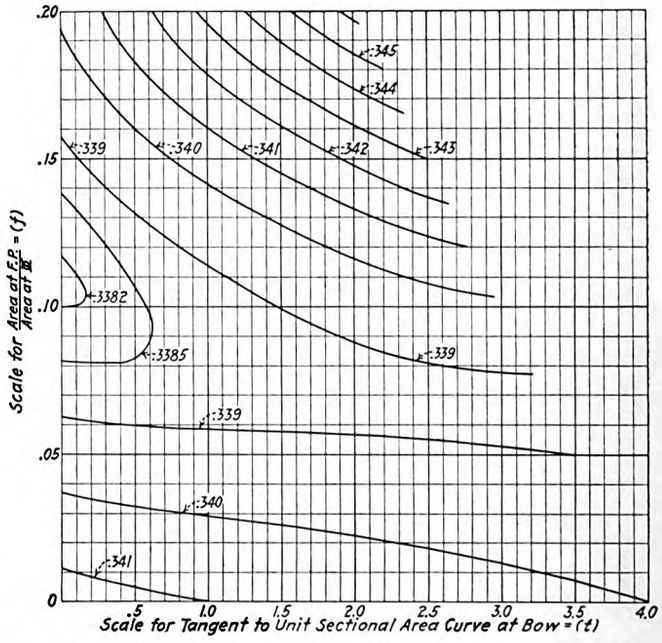

Fig. 2.—Series B. Contours of Wetted Surface Coefficients = C. W.S. = C $\sqrt{P \times L}$, Where P = Displacement of Model in Pounds and L= Length in Feet (P Is for Fresh Water)

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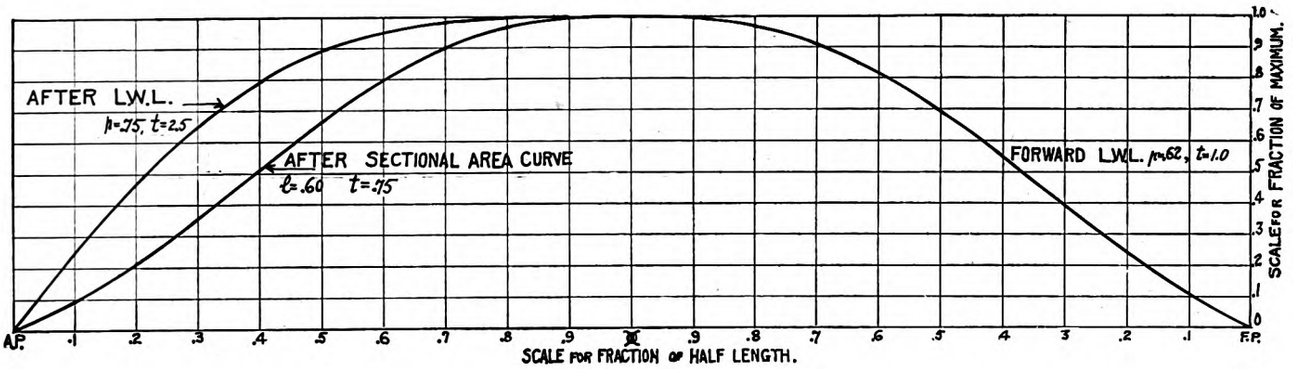

Fig. 3.—Series A

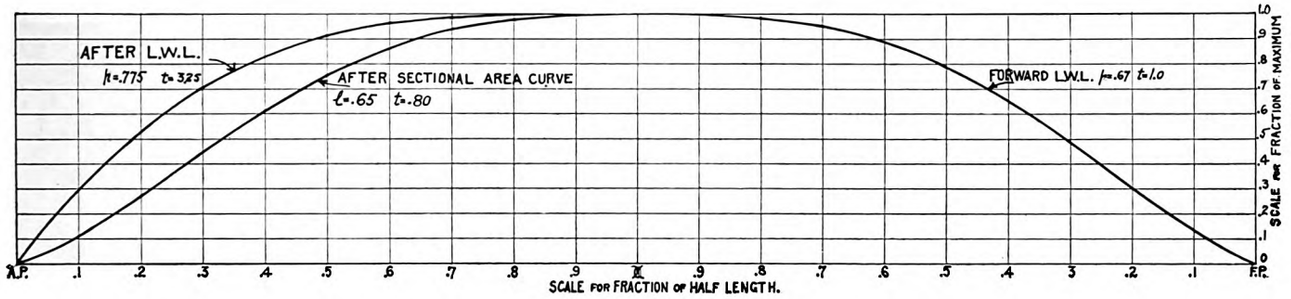

Fig. 4.—Series B

resistance of varying the bow slope of curves of sectional area.

In what follows, this slope is expressed by a quantity t obtained as follows, for the normal form, where the ordinate of the sectional area curve is zero at the bow or fore perpendicular:

Draw the tangent at the bow to the curve of sectional areas. This will cut the vertical at the center of length, intercepting on it a certain ordinate. Then t is the ratio between this ordinate and the ordinate of the sectional area curve at the center of length.

How the Bulbous Bow Is Expressed in Figures

Now we need to express the bulbous bow in figures, so to speak. This is done as follows: The sectional area curve instead of coming to zero value at the fore perpendicular has an ordinate there, representing an area at the fore per-

TABLE I

Model No.	Wetted Surface in Sq. Ft.	t	f
2,155	48.00	.30	
2,156	48.03	1.20	0
2,157	48.07	2.10	
2,158	48.10	3.00	
2,159	48.09	.26	
2,160	48.12	1.04	.04
2,161	48.15	1.82	
2,162	48.19	2.60	
2,163	48.17	.22	
2,164	48.21	.88	.08
2,165	48.24	1.54	
2,166	48.27	2.20	
2,167	48.26	.18	
2,168	48.29	.72	.12
2,169	48.33	1.26	
2,170	48.36	1.80	
2,386	48.35	.14	
2,387	48.38	.56	.16
2,388	48.41	.98	
2,389	48.45	1.40	

Series A—Constants for All Models

Length ..... 20 feet
Beam ..... 2.283 feet
Draft ..... 0.681 feet
Displacement ..... P = 1,050 lbs.
Longitudinal coef. ..... l = .60
Midship section coef. ..... m = .92

Disp. length ratio ..... $\frac{\Delta}{\left(\frac{L}{100}\right)^3} = 60$

Ratio beam to draft ..... $\frac{B.}{H.} = 3.35$

Coef. of L.W.L. For'd ..... p = .62
Coef. of L.W.L. aft ..... p = .75

TABLE II

Model No.	Wetted Surface in S.q Ft.	t	f
2,382	78.23	0	
2,351	78.16	.40	
2,352	78.08	1.60	0
2,353	77.98	2.80	
2,354	77.90	4.00	
2,383	77.84	0	
2,355	77.78	.35	
2,356	77.74	1.40	.05
2,357	77.70	2.45	
2,358	77.68	3.50	
2,384	77.48	0	
2,359	77.51	.30	
2,360	77.60	1.20	.10
2,361	77.74	2.10	
2,362	77.88	3.00	
2,385	77.64	0	
2,363	77.72	.25	
2,364	78.00	1.00	.15
2,365	78.30	1.75	
2,366	78.60	2.50	
2,414	78.50	.80	
2,415	78.07	.20	.20
2,416	77.64	—.40	

Series B—Constants for All Models

Length ..... 20 feet
Beam ..... 3.232 feet
Draft ..... 1.01 feet
Displacement ..... P = 2,625 lbs.
Longitudinal coef. ..... l = .65
Midship section coef. ..... m = .99

Disp. length ratio ..... $\frac{\Delta}{\left(\frac{L}{100}\right)^3} = 150$

Ratio beam to draft ..... $\frac{B.}{H.} = 3.2$

Coef. of L.W.L. for'd ..... p = .67
Coef. of L.W.L. aft ..... p = .775

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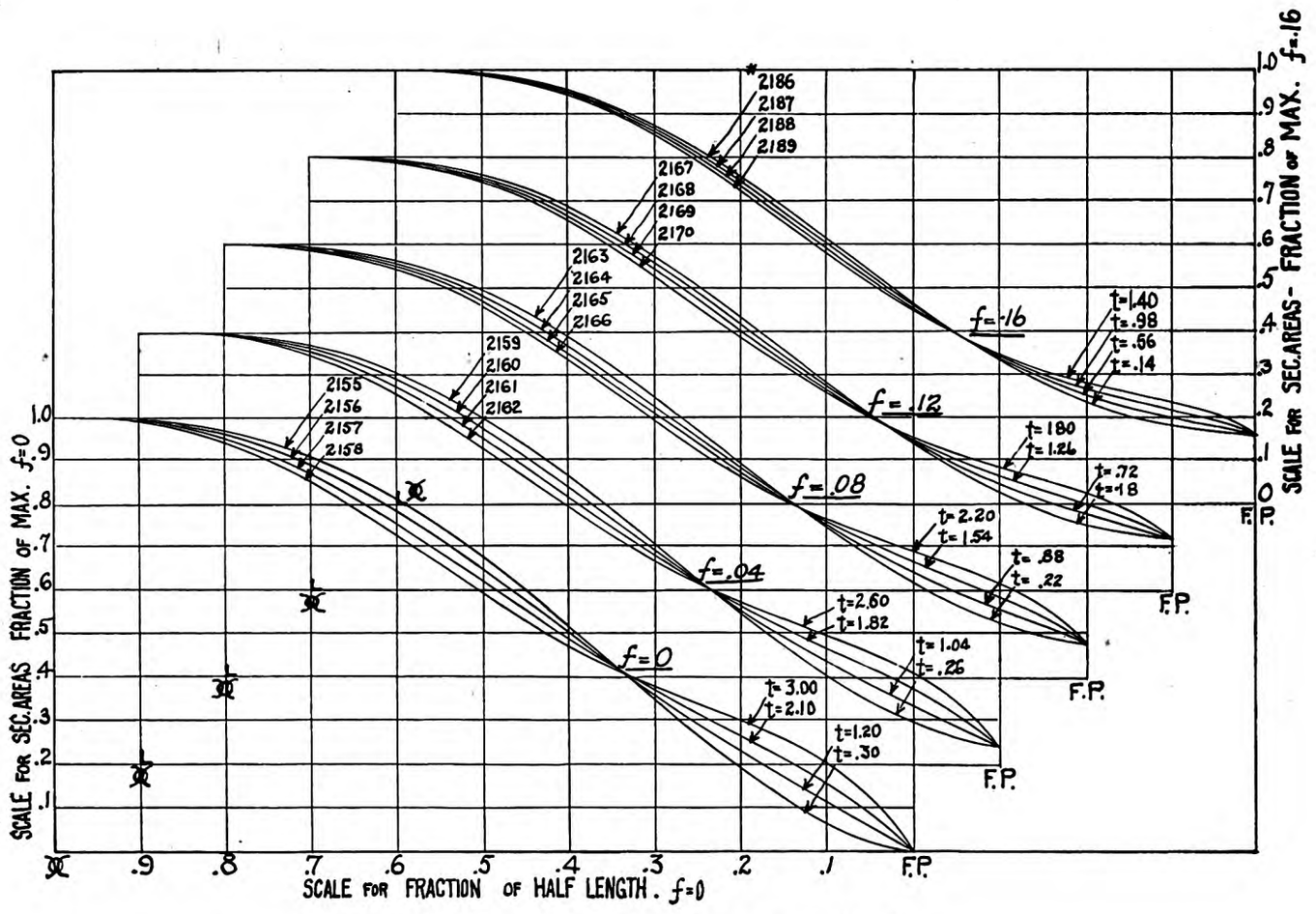

Fig. 5.—Series A—Sectional Area Curves—l = 0.60

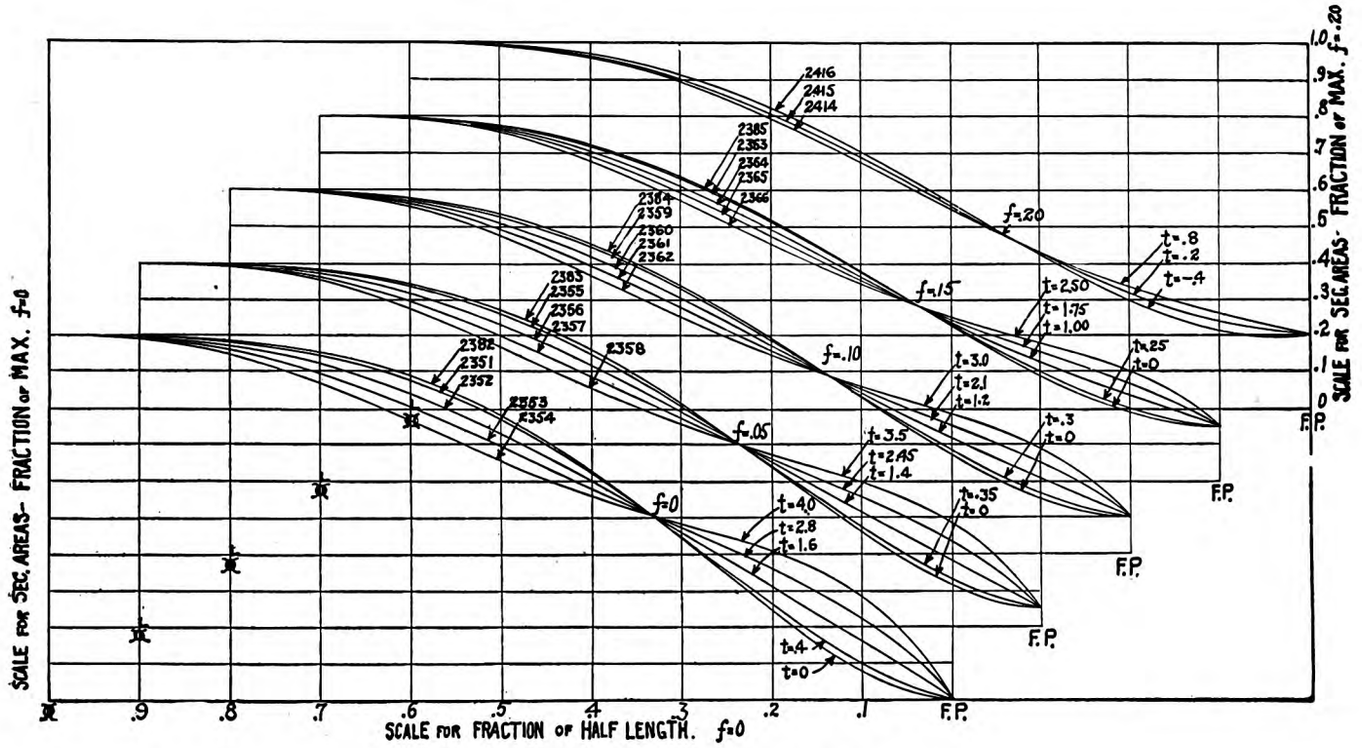

Fig. 6.—Series B—Sectional Area Curves—l = 0.65

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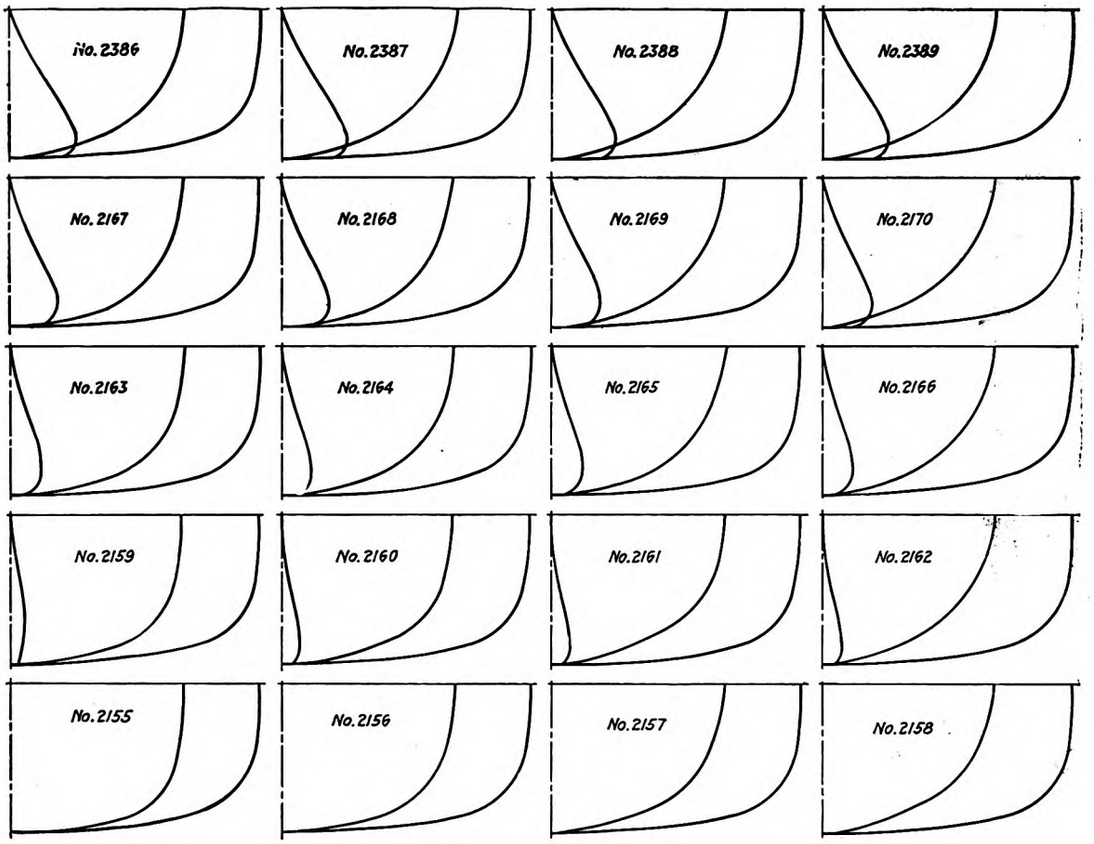

Fig. 7.—Series A

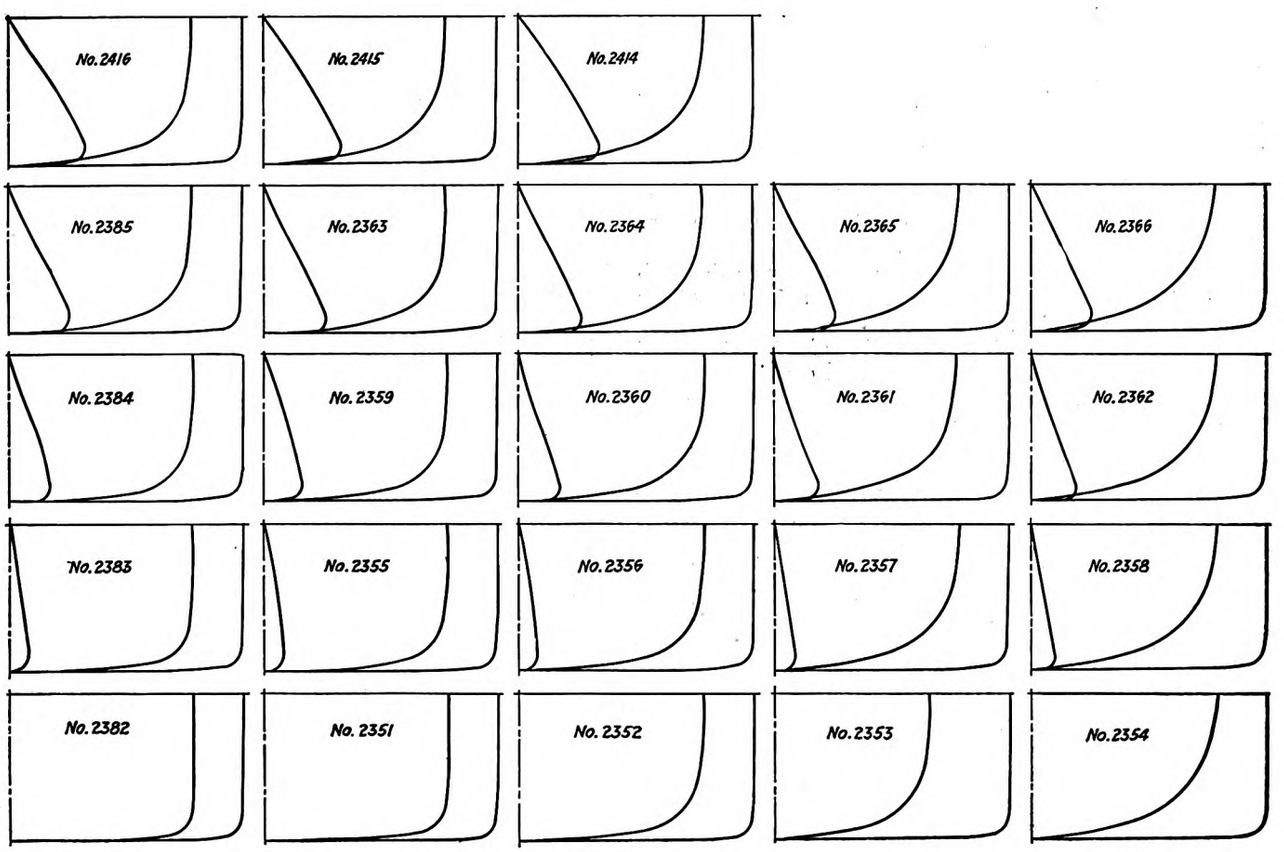

Fig. 8.—Series B

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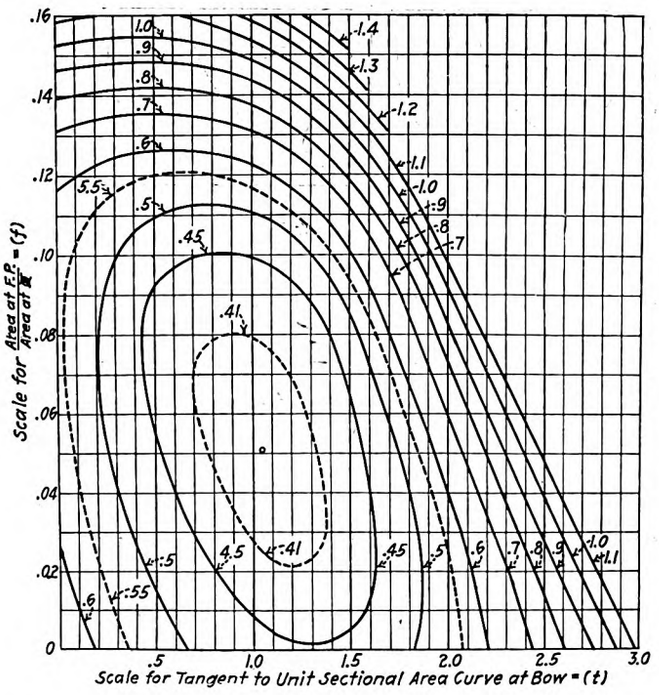

Fig. 9.—Series A. $\frac{R_t}{\Delta} = 3.7$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.559$

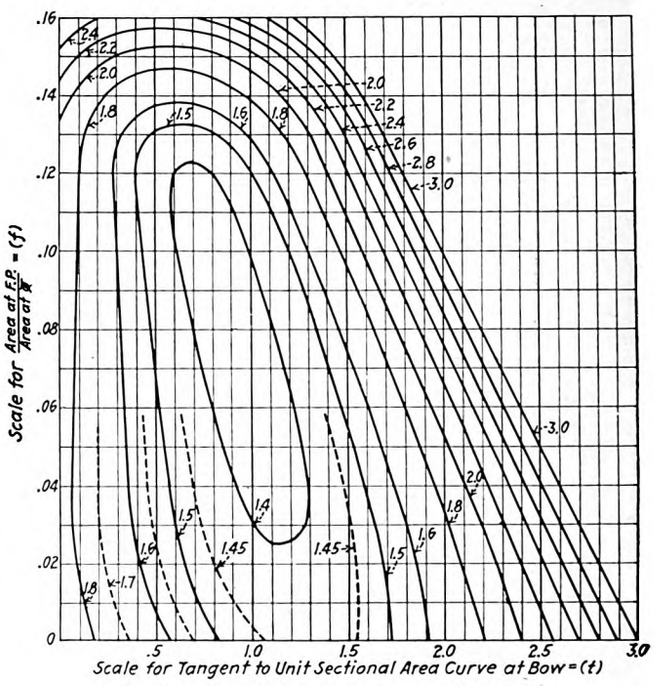

Fig. 10.—Series A. $\frac{R_t}{\Delta} = 7.0$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.783$

pendicular and the extent of bulbousness, if it may be so called, is expressed by the ratio between this fore perpendicular area and the area of the midship section. We thus have the shape that would be found, if we designed a ship with a very long under water ram and then cut it square off at the fore perpendicular.

However, we do not test a model with a square nose in front. Having made it as described above, the ends of the water lines are rounded in circular form, the radius varying with each line so that the circular termination passes through the fore perpendicular and is tangent to the water line of the square nosed form. In the figures the bulb section at the fore perpendicular is shown before rounding the corners thus corresponding to the actual section a short distance—a very short distance indeed—abaft the fore perpendicular.

In what follows the symbol f is used to denote the bulb area at the fore perpendicular expressed as a fraction of the area of midship section.

When f has a value it is necessary in order to determine t correctly to deduct f from both the midship ordinate of the tangent at the bow and the midship ordinate of the curve of sectional areas and then proceed as before.

Features of Bulbs Tested

Now what were the features of the bulbs tested? They are best characterized by the sections at the fore perpendicular. These are made tangent to the vertical at the water line for small bulbs but meet it at an angle for large bulbs, then swell out continually nearly to the keel and have a wide flat at the keel level. Figs. 7 and 8 show these sections.

In other words the bulb in the experiments I am dealing with was roughly of triangular section with its base at the keel level and its apex at the load water line.

The two sets of models I am particularly concerned with were Model Tank Series 45 and 46, but for brevity we will call them here the *A* and *B* series, *A* consisting of 20 models and *B* of 23 models. Their dimensions are given in Table I for *A* models and Table II for the *B* models. As may be seen, the *A* models were of fine block coefficient 0.552 and small displacement length ratio 60. Expanded to a 400-foot length they would have displaced 3,840 tons with a beam 45.66 feet and a draft of 13.62 feet only. This shallow draft renders it harder for the bulbous bow to show its full virtue.

Models *B* of 0.6435 block and 150 displacement length ratio, if expanded to a 400 foot length, would displace 9,600 tons on a beam of 64.64 feet and a draft of 20.2 feet. They are of battleship type while the *A* models are more of the fast passenger vessel or battle cruiser type.

It will be observed in Tables I and II that the wetted surface varies with t and f. The variations are not great enough to amount to much but are shown graphically in Figs. 1 and 2 as contours of wetted surface coefficient on ordinates of f and abscissæ of t.

Space does not permit giving the lines of the 43 models but Figs. 3 to 6 give information as to their forms. Figs. 3 and 4, referring to the *A* and *B* models respectively, show the constant water lines and the constant after body curves of sectional area. In each series the changes of form were entirely forward of the midship section and below the fore body water line, being greatest near the keel. Figs. 5 and 6 show the fore body curves of sectional area of the 20 models of Series *A* and the 23 of Series *B*, grouped by f values. To avoid confusion and at the same time save space, each group of these curves is kept clear vertically of other groups by suitable shifting of scales.

Variation of f Areas

Owing to the fact that for each group there is a wide variation of t the variations in the fore parts of the sectional area curves are quite as radical as the variations of f areas. As regards these latter—the f areas—Figs. 7 and 8 show for each model of each series the constant midship section, the bulbous section at the fore perpendicular and a section half way between the bow and the midship section. Tables I and II should be consulted in connection with Figs. 7 and 8. Scrutiny of Figs. 7 and 8 make it obvious that many forms tested were remarkable. The models themselves show to the eye the variation of t as well as of f and to the conventional eye many of them would appear truly ridiculous. It is only

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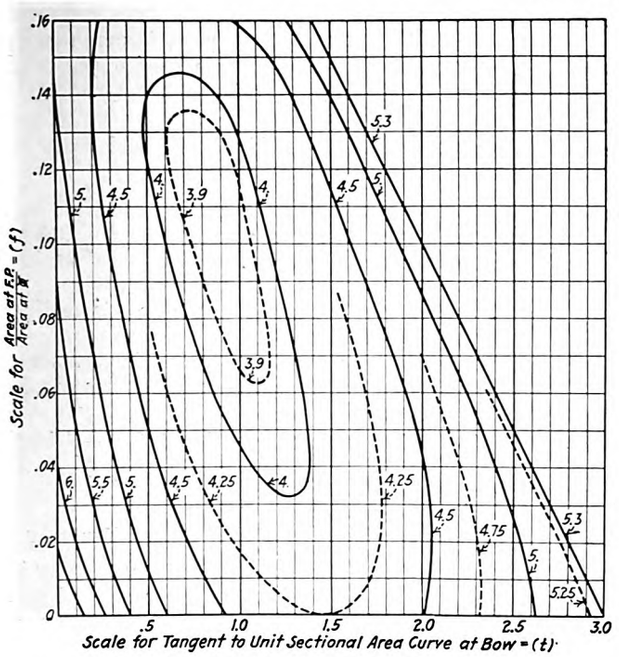

Fig. 11.—Series A. $\frac{R_t}{\Delta} = 11.0$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 1.006$

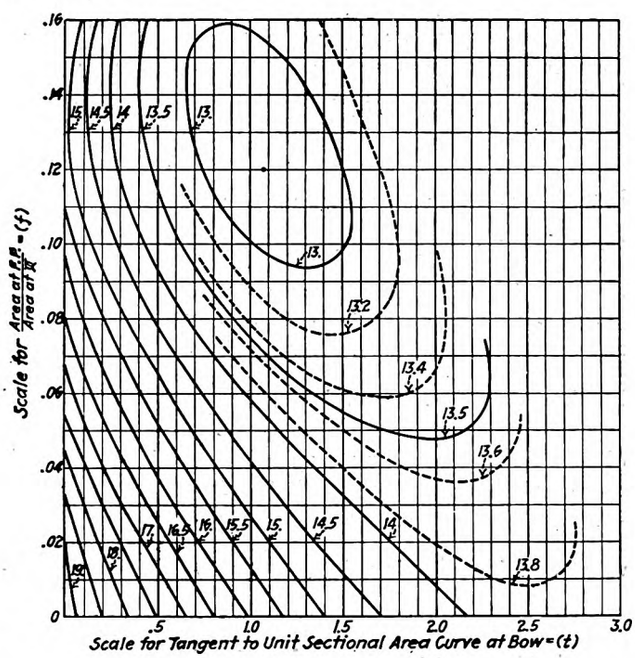

Fig. 13.—Series A. $\frac{R_t}{\Delta} = 16.1$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 1.230$

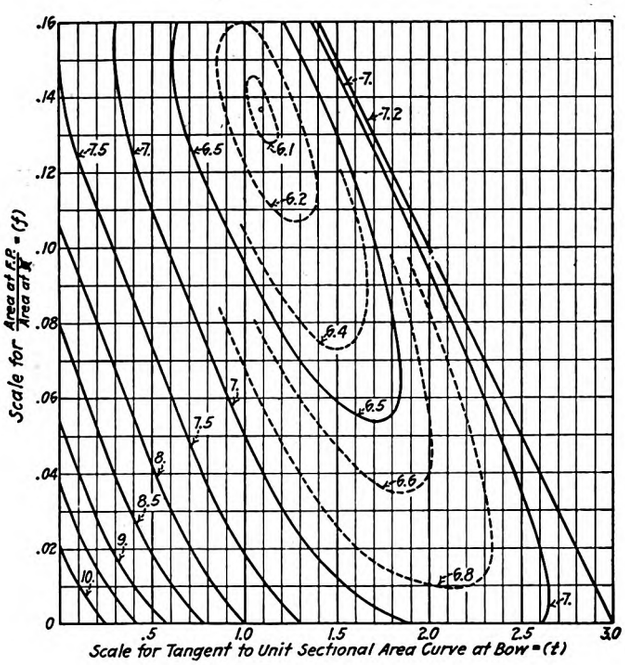

Fig. 12.—Series A. $\frac{R_t}{\Delta} = 13.2$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 1.118$

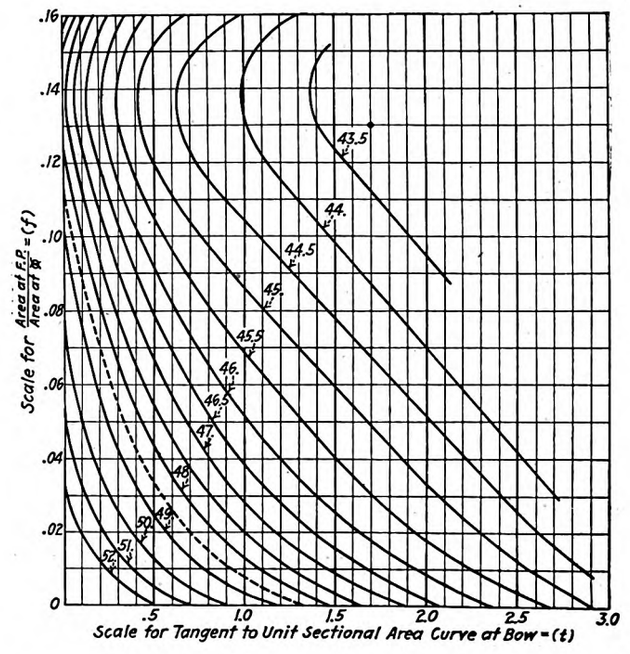

Fig. 14.—Series A. $\frac{R_t}{\Delta} = 21.7$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 1.454$

by such a *reductio ad absurdum*, however, that in systematic or series tests we can be sure of covering the ground. It is rather remarkable also that so many abnormal forms in these experiments showed such small departure from normal resistance.

I come now to the results. The frictional resistance of R_t is taken as dependent on surface only and the residuary resistance R_r was finally plotted as contours of residuary resistance in pounds per ton upon t and f as primary variables.

Results of the Model Tests

A separate set of contours was laid down for each value of $\frac{V}{\sqrt{L}}$, the usual dimensions less coefficient expressing speed, V being speed in knots and L length in feet.

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At low speeds the frictional resistance is by far the major factor in the total resistance and only at very high speeds is it surpassed by the residuary. So in order to avoid forgetting this fact there is recorded upon each contour diagram a frictional resistance corresponding to the speed. Since the frictional surface varies slightly with t and f and the frictional resistance by our standard formulæ varies with length of vessel, it is necessary to base the figures of $\frac{R_t}{\Delta}$ upon an average wetted surface and a definite length. For the A models the wetted surface coefficient used (see Fig. 1) was 0.3325 and for the B models (Fig. 2) 0.3390. The standard assumed length was 400 feet. The values of $\frac{V}{\sqrt{L}}$ to which the several diagrams refer do not convey much idea of actual speeds except to experts. But multiplied by 20 or $\sqrt{400}$ they become actual speeds of a 400-foot vessel. The speed of a vessel of this length is $0.5 \times 20 = 10$ knots when $\frac{V}{\sqrt{L}} = 0.5$. It is $0.8 \times 20 = 16$ when $\frac{V}{\sqrt{L}} = 0.8$ and so on.

Consider now the diagrams. Figs. 9 to 20 show contour diagrams that have been selected as typical from a larger number, Figs. 9 to 14 refer to models A and 15 to 20 to models B.

Series A—Fine, Fairly Fast Vessels

Consider first the Series A figures. Fig. 9, corresponding to 11.18 knots for a 400-foot vessel, shows $f = 0.05$, $t = 1.0$ as about the best combination. Consider first, however, the case of the normal type vessel without a bulb. For this case $f = 0$. It is interesting to note in Fig. 9 that when $f = 0$ the residuary resistance varies decidedly with t, the pounds per ton ranging from the minimum of 0.45, when $t = 1.25$, to 0.6, when $t = 0$, and 1.1, when $t = 3$.

As we give f increasing values there is a falling off in t for best results. The minimum residuary is about 0.4 when $f = 0.05$. This is a 10 percent reduction from the minimum without a bulb. However, since the frictional resistance at this speed is about 3.7 pounds per ton, the gain from the bulb is only about 1 percent—a real gain but a small one.

Passing now to Figs. 10 to 14 we see that the actual residuary resistance and its relative importance increase steadily with speed. Until $\frac{V}{\sqrt{L}} = 1$ about, corresponding to 20 knots for a 400-foot ship, the best t keeps in the vicinity of 1. The best f increases steadily until it is over 10 percent at 20 knots. The maximum gain possible from the bulbous bow remains somewhere near 10 percent of the residuary up to $\frac{V}{\sqrt{L}} = 1$, but at this speed it is some 3 percent of the total instead of 1 percent as at 11 knots.

Above $\frac{V}{\sqrt{L}} = 1$, in Figs. 12, 13 and 14, there is rather a rapid change in type of the figures. In the first place for $f = 0$ the best value of t, which has been increasing slowly over that for lower speeds, increases rapidly until in Fig. 14, when $\frac{V}{\sqrt{L}} = 1.454$, it is over 3. The best value of f increases to 13 or 14 percent and the possible percentage of gain, from a bulbous bow, increases to over 6 percent in Fig. 14, if we hold t to the values best for speeds below $\frac{V}{\sqrt{L}} = 1$. On the other hand, if we are bold enough to choose t large enough, there is no gain at all from the bulb.

It is seen from Fig. 14 that for 29 knots on a 400-foot ship we would want t greater than 3. The curve of sectional areas of Model 2158 in Fig. 5 has $t = 3$ and it evidently approaches the swan form. Furthermore the bow is really of the bulbous type only the bulb does not extend to the fore perpendicular. The matter is not of practical importance for we know too much about the broad features of form to adopt the 0.60 longitudinal coefficient of Series A for $\frac{V}{\sqrt{L}}$ in the vicinity of 1.5.

Total Resistance Reduced from 1 to 3 Percent

Summing up the Series A results we may say that for it a properly chosen bulbous bow will save us something like 10 percent of the residuary resistance and from 1 to 3 percent of the total for speeds up to a $\frac{V}{\sqrt{L}}$ value of unity. At higher speeds the relative saving is less and disappears at speeds as high as $\frac{V}{\sqrt{L}} = 1.5$, if we select t to suit the speed.

As regards t, the best value remains close to 1 until we reach a $\frac{V}{\sqrt{L}}$ value in the vicinity of unity. It then increases rather rapidly with $\frac{V}{\sqrt{L}}$ until it reaches 3 when $\frac{V}{\sqrt{L}} = 1.25$ and increases still more for higher speeds.

Series A has thrown light upon a matter that had puzzled me for years. The Standard Series whose results were published in "Speed and Power of Ships" had good lines and was seldom surpassed as regards resistance by the lines of models tested in the Model Basin prepared by various naval architects. Now and then we had models that beat it at some speeds but at about $\frac{V}{\sqrt{L}} = 1$, the Standard Series seemed unbeatable. I feared that we had faired into the Standard Series results at about that speed something that did not exist; but bearing in mind that the Standard Series had a bulbous bow—though not a very large bulb—it is now evident that it thereby had a handicap in its favor at the very speeds where it seemed unbeatable.

Series B—Rather Full, Moderate Speed Vessels

Let us now consider Series B—Figs. 15 to 20. Here we are dealing with a fat full-bodied vessel and there is no use pushing our results much beyond $\frac{V}{\sqrt{L}} = 0.9$.

One thing that strikes us at once is that at low and moderate speeds the best value of t is not about unity but about zero.

While this may seem strange at first sight it is quite in accordance with many model tests of moderate speed vessels.

Of course it is well known that for high speed vessels we

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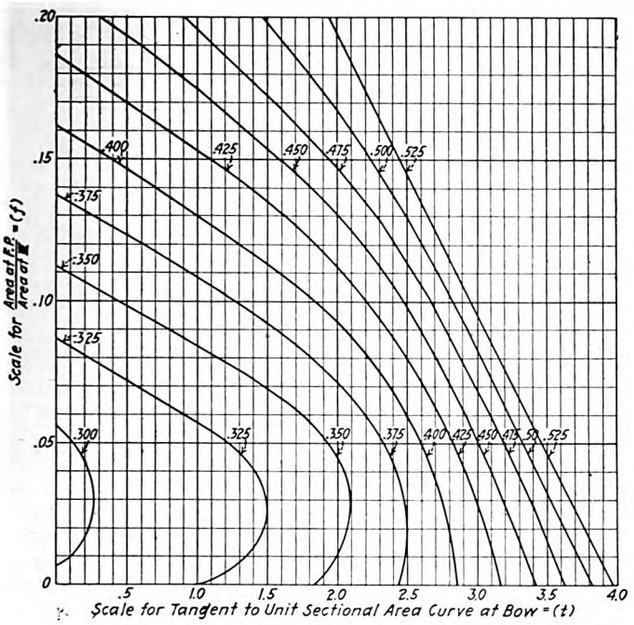

Fig. 15.—Series B. $\frac{R_t}{\Delta} = 1.6$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.447$

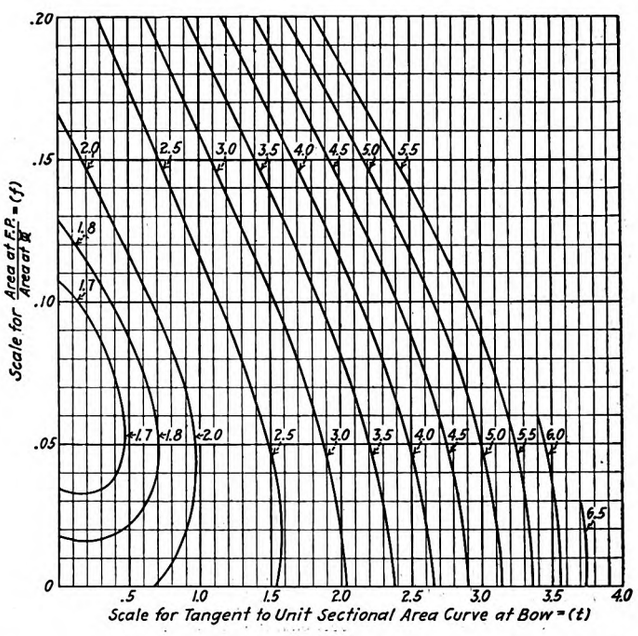

Fig. 17.—Series B. $\frac{R_t}{\Delta} = 4.7$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.805$

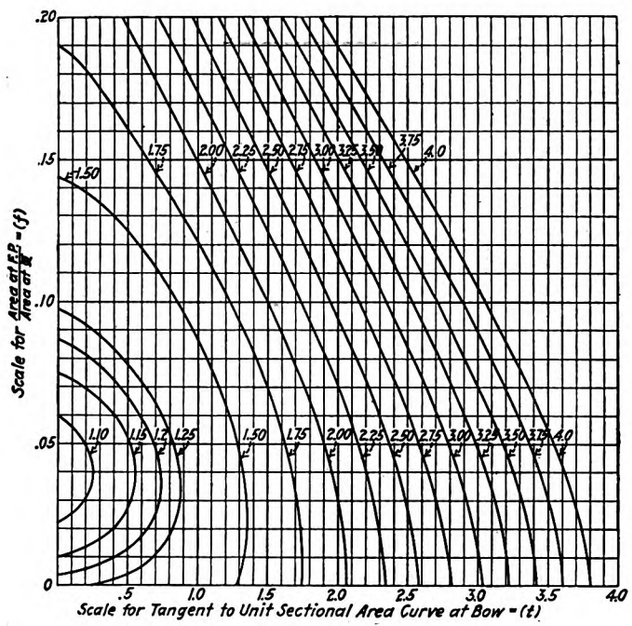

Fig. 16.—Series B. $\frac{R_t}{\Delta} = 3.9$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.715$

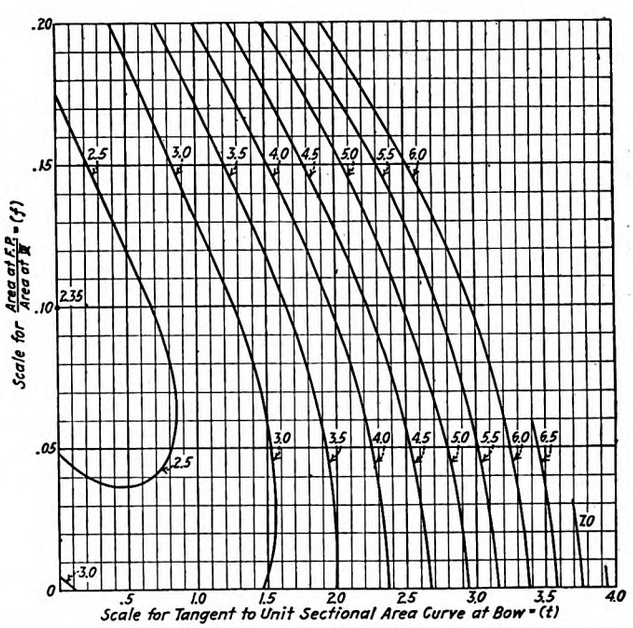

Fig. 18.—Series B. $\frac{R_t}{\Delta} = 5.3$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.850$

need large longitudinal coefficients which are associated with full ends and for low speed vessels small longitudinal coefficients with their resulting fine ends are the best. It almost seems from the *A* and *B* models that when we attempt to differentiate further for moderate speed vessels we should adopt as our slogan—"The Fuller the Body, the Finer the Bow."

The Fuller the Body, the Finer the Bow

It will be observed in fact that for Series *B* the contours indicate minimum residuary at some speeds for negative values of *t*. Of course where *f* has a value, negative values of *t* are physically possible as in Model 2416, but I will not undertake to pursue *t* below zero.

The table below summarizes Figs. 15 to 20.

Figure Number	15	16	17	18	19	20
$V/\sqrt{L}$	.447	.715	.805	.850	.894	.939
Corresponding speed for 400-foot vessel	8.94	14.30	16.10	17.00	17.88	18.78
Best value of *t* where $f = 0$	0	0	0.35	0.75	1.10	1.50
Best value of *f*	.03	.04	.07	.10	.13	.17
Corresponding value of *t*	0	0	0	0	.5	.5
Percent residuary resistance that can be saved by bulb	..	13	13	16	25	33
Percent total resistance that can be saved by bulb	..	3	3	6	13	18

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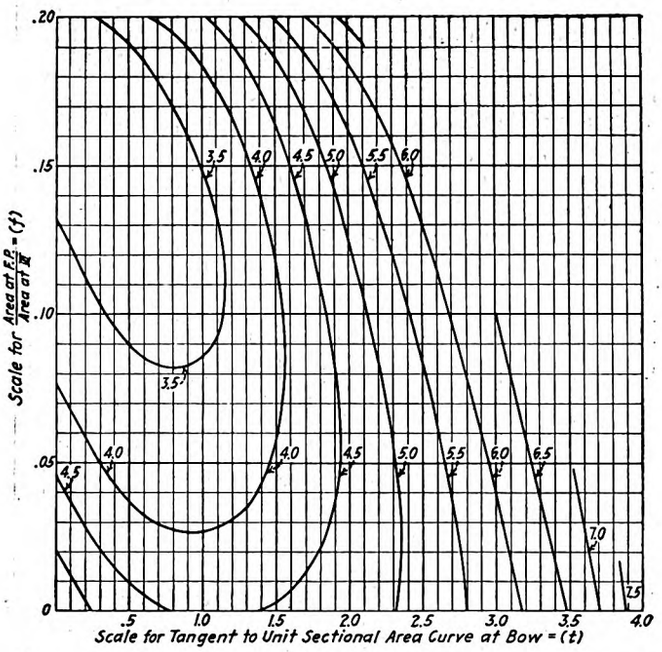


Fig. 19.—Series B. $\frac{R_t}{\Delta} = 5.7$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.894$

Without attempting to draw too many conclusions from two series of experiments, it would seem evident that there are conditions where the bulbous bow is desirable from the point of view of resistance. Even if we do not take a chance with the *f* value needed to make the maximum saving, there are speeds where a much smaller bulb will be distinctly worth while.

In practice, a flat bottomed bulb would give trouble by pounding in a rough sea but a flat bottomed bulb is not necessary.

I have heard no complaints of pounding of the bulbous bows actually fitted on our battleships. The ingenious naval architect will have no difficulty in devising bulbous forms where little or no furnacing of the structural plating is necessary.

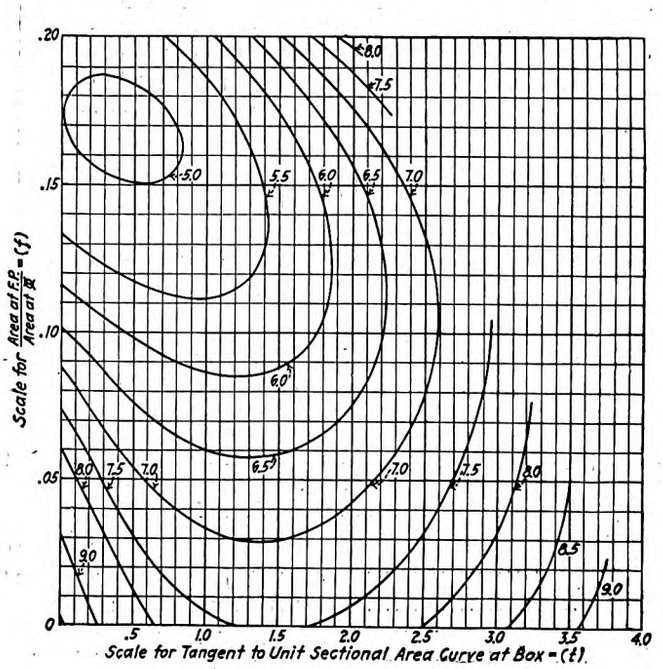


Fig. 20.—Series B. $\frac{R_t}{\Delta} = 6.3$. Contours of $\frac{R_r}{\Delta}$ for $\frac{V}{\sqrt{L}} = 0.939$

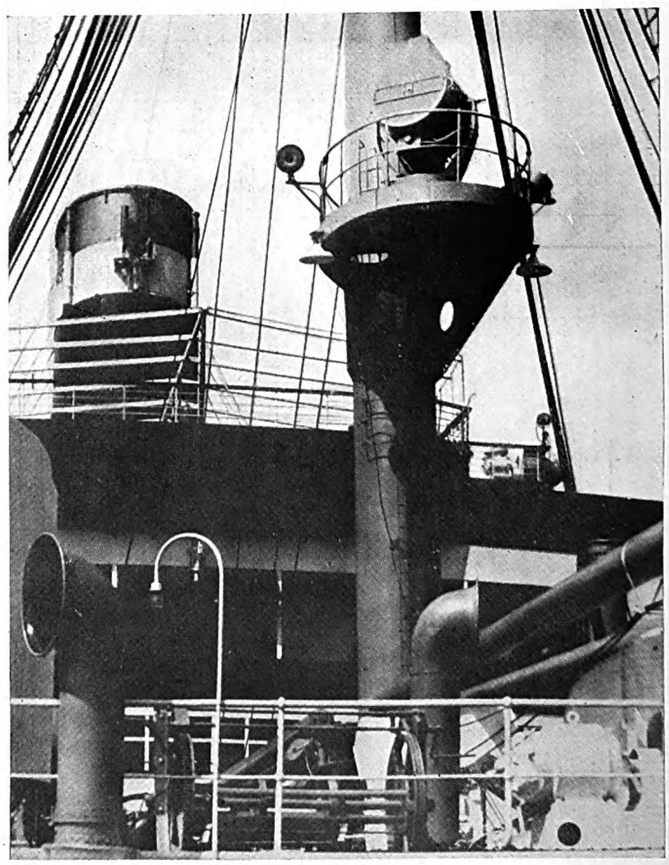
Effect of Bulbous Bow on Other Types of Vessels

In conclusion I may point out that Series *A* and *B* deal with two important types, the fine fairly fast vessel and the rather full moderate speed vessel. There are two other broad types of interest, the very full low speed vessel and the full very fast vessel such as a destroyer.

As regards the former the effect of the bulbous bow has not been investigated at the Model Basin. Such vessels generally have in service such extreme variation of draft forward that for them the bulbous bow would be a dubious proposition to say nothing of the fact that their speeds are generally below those for which from experiments to date the bulbous bow is indicated.

A series has been recently tested of the long full ended slab sides destroyer type and the savings by the bulbous bow seem decidedly less than for Series *A* and *B*. The results are of little interest to the mercantile shipbuilder while the results of *A* and *B* are not only of general interest but liable to have a direct dollars and cents bearing upon some problems of mercantile shipbuilding.

Monthly Shipbuilding Report.—The Bureau of Navigation, Department of Commerce, reports 116 sailing, steam, gas and unrigged vessels of 9,760 gross tons built in the United States and officially numbered during the month of July.



Powerful Sperry Searchlight Mounted on Foremast of the Leviathan

This 36-inch searchlight is the most powerful aboard any merchant vessel, and gives a 450,000,000 candle power beam. Reports from the trial trip of the "Leviathan" advise that an object was seen twenty-one miles by this searchlight, which, incidentally, is the same powerful type searchlight that was seen by the U. S. Army Aviators Kelly and Macready fifty miles from Bellville.

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Applications of Arc Welding to Ship Construction-III

Details of Isherwood Design for Welded Ship—Process of Erection—The Caldwell All-Electrically Welded Barge

By E. H. Ewertz*

THE success obtained by the electric arc welding process urged men of initative on to greater accomplishments, and Mr. A. J. Mason, while associated with the United States Shipping Board during the war period, proposed using a large electric spot welder in place of riveting for holding various members together, finishing the joints with electric arc welding in place of calking. This suggestion was approved by the United States Shipping Board to the extent that a 42 foot sample section of a 9,600 ton ship was ordered constructed. However, the signing of the Armistice caused this work to be suspended, which is much to be regretted. "Had this experiment been carried to conclusion, it would have demonstrated a great saving in hull construction," Captain J. Caldwell, managing director of the Alloy Welding Processes, Ltd., remarked, in his report to the Emergency Fleet Corporation.

About the time the United States Shipping Board ordered this sample section of a 9,600 ton ship to be built, another novel proposal was made by Mr. C. P. M. Jack, under the direction of the Electric Welding Committee of the Emergency Fleet Corporation. Mr. Jack aimed to fabricate large sections of the ship in the shop, reducing the work on the ways

*General Manager, Moore Plant, Bethlehem Shipbuilding Corporation, Ltd., Elizabeth, N. J.

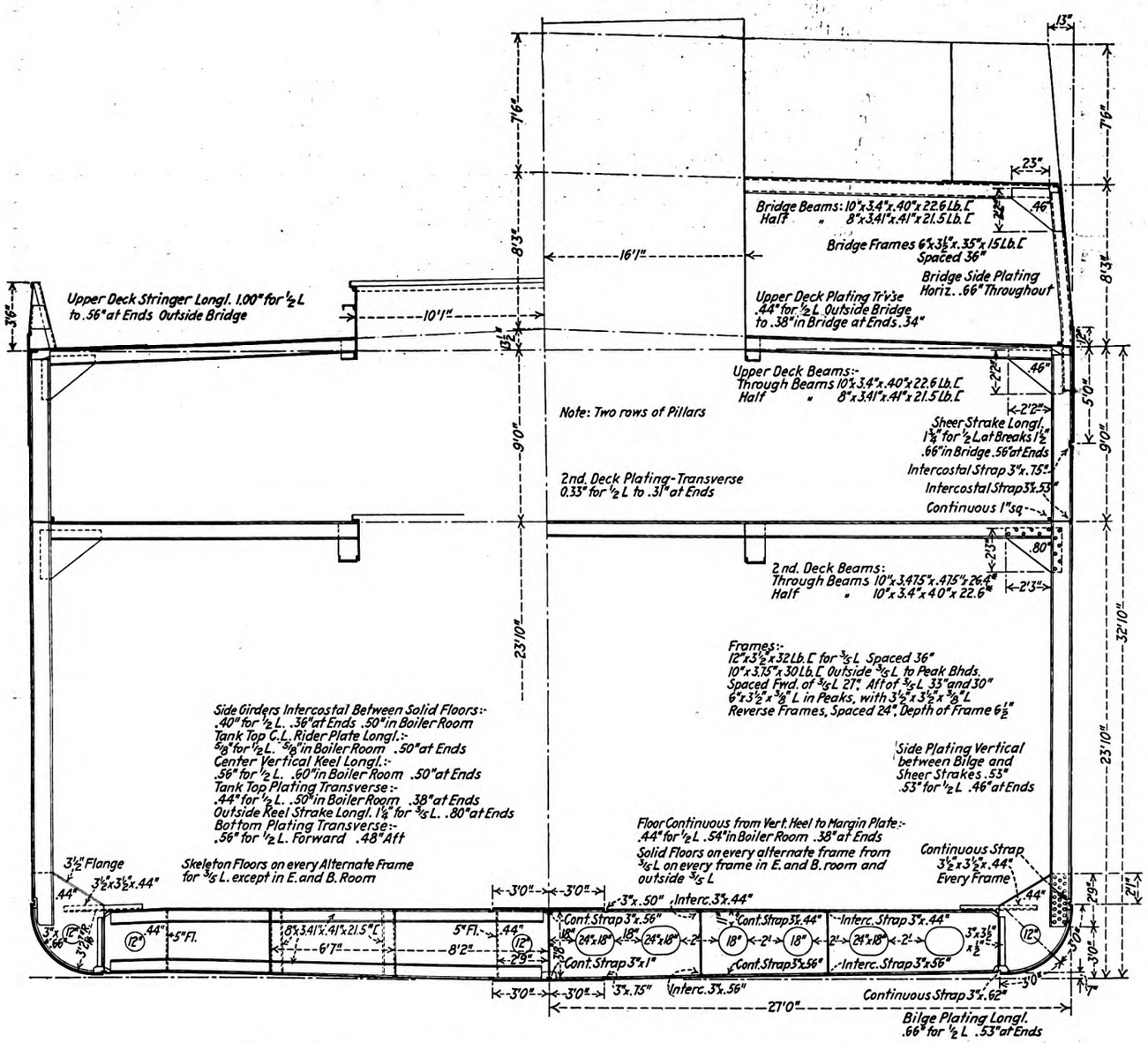
Bridge Beams: 10"x3.4"x.40"x22.6 Lb. [
Half " 8"x3.41"x.41"x21.5 Lb. [
Bridge Frames 6"x3½"x.35"x15 Lb. [Spaced 36"
Bridge Side Plating Horiz. .66" Throughout
Upper Deck Plating Tr'v'se .44" for ½ L Outside Bridge to .38" in Bridge at Ends .34"
Upper Deck Stringer Longl. 1.00" for ½ L to .56" at Ends Outside Bridge
Upper Deck Beams:-
Through Beams 10"x3.4"x.40"x22.6 Lb. [
Half " 8"x3.41"x.41"x21.5 Lb. [
Note: Two rows of Pillars
Sheer Strake Longl. 1½" for ½ L at Breaks 1½" .66" in Bridge .56" at Ends
Intercostal Strap 3"x.75"
Intercostal Strap 3"x.53"
Continuous 1"sq.
2nd. Deck Plating-Transverse 0.33" for ½ L to .31" at Ends
2nd. Deck Beams:
Through Beams 10"x3.475"x.415"x26.4#
Half " 10"x3.4"x4.0"x22.6#
Frames:-
12"x3½"x32 Lb. [for ⅜ L Spaced 36"
10"x3.75"x30 Lb. [Outside ⅜ L to Peak Bhds.
Spaced Fwd. of ⅜ L 27" Aft of ⅜ L 33" and 30"
6"x3½"x⅜" L in Peaks, with 3½"x3½"x⅜" L
Reverse Frames, Spaced 24". Depth of Frame 6½"
Side Girders Intercostal Between Solid Floors:-
.40" for ½ L. .36" at Ends .50" in Boiler Room
Tank Top C.L. Rider Plate Longl.:-
⅝" for ½ L. ⅝" in Boiler Room .50" at Ends
Center Vertical Keel Longl.:-
.56" for ½ L. .60" in Boiler Room .50" at Ends
Tank Top Plating Transverse:-
.44" for ½ L. .50" in Boiler Room .38" at Ends
Outside Keel Strake Longl. 1¼" for ⅜ L. .80" at Ends
Bottom Plating Transverse:-
.56" for ½ L. Forward .48" Aft
Side Plating Vertical between Bilge and Sheer Strakes .53" for ½ L .46" at Ends
Floor Continuous from Vert. Keel to Margin Plate:-
.44" for ½ L .54" in Boiler Room .38" at Ends
Solid Floors on every alternate frame from ⅜ L on every frame in E. and B. room and outside ⅜ L
Continuous Strap 3"x3½"x.44" Every Frame
3½" Flange
3½"x3½"x.44"
Skeleton Floors on every Alternate Frame for ⅜ L. except in E. and B. Room
Cont. Strap 3"x.56"
Cont. Strap 3"x1"
Cont. Strap 3"x.44"
Cont. Strap 3"x.56"
Interc. Strap 3"x.44"
Interc. Strap 3"x.56"
Interc. 3"x.56"
Continuous Strap 3"x.62"
Bilge Plating Longl. .66" for ½ L .53" at Ends
5"Fl.
6'7"
8'2"
16'1"
10'1"
23'10"
9'0"
8'3"
7'6"
32'10"
27'0"

Fig. 63.—Midship Section, 9,600-Ton Steamship Designed by C. P. M. Jack

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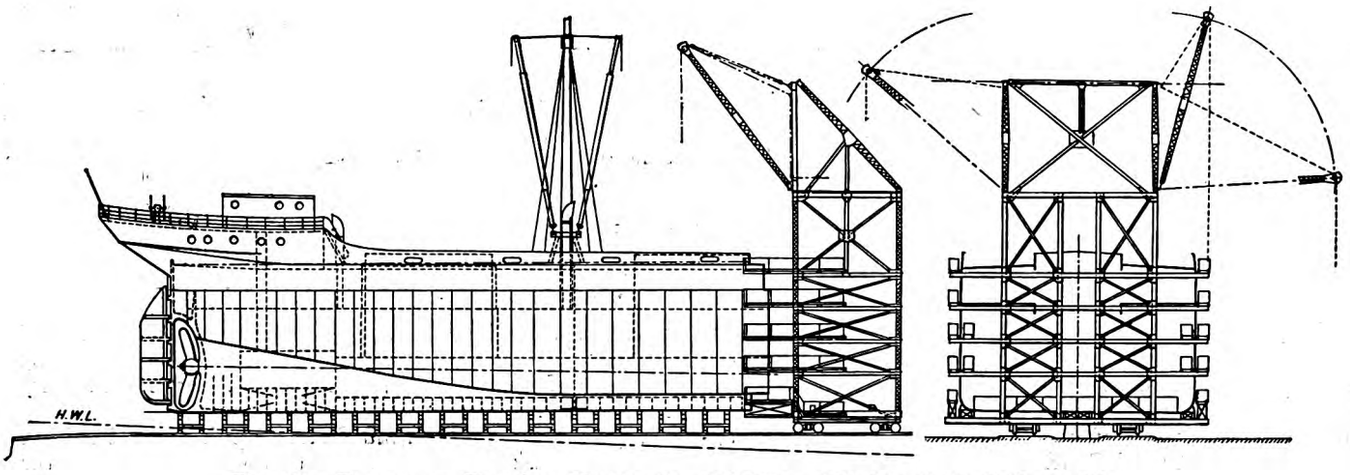

Fig. 64.—Transverse Erection Header for 9,600-Ton Fabricated Steel Steamship

to a minimum, and so designed a ship that work could be started at the stern and section after section built until the bow was reached, when it would be ready for launching. Shell and deck plating was arranged on the transverse line, except keel, bilge, sheer and deck stringer plating, which, with the keelsons and vertical keel were run as usual fore and aft, but in this design these members are made heavier to be able to absorb all stresses. To accomplish the sectional construction, a large header moving on tracks and supporting two electric cranes as well as the necessary staging, and having on it, shops for various mechanics such as carpenters, welders, etc., was introduced. As each 6 foot section of the ship was completed every eight hours, this header was moved ahead to make room for the next section. With a ship of standard design built under this system of construction, it was estimated that not only would each 6 foot section of construction work be completed every eight hours but also that the interior work would make similar progress. As can be seen from the plans the design is for a freight steamer, 401 feet 0 inches between perpendiculars, 54 feet 0 inches beam and 32 feet 10 inches depth.

Isherwood Design

Sir J. W. Isherwood has designed a modified longitudinal frame ship, the modifications consisting of the use of electric arc welding for the making of practically all joints, the design being in accordance with Lloyd's Register of Shipping rules for electric welded vessels. The principal dimensions are length between perpendiculars 303 feet 0 inches, beam molded 45 feet 3 inches, molded depth 26 feet 3 inches, and about 3,960 deadweight tons. The design is such that no overhead welding is required for strength members, and

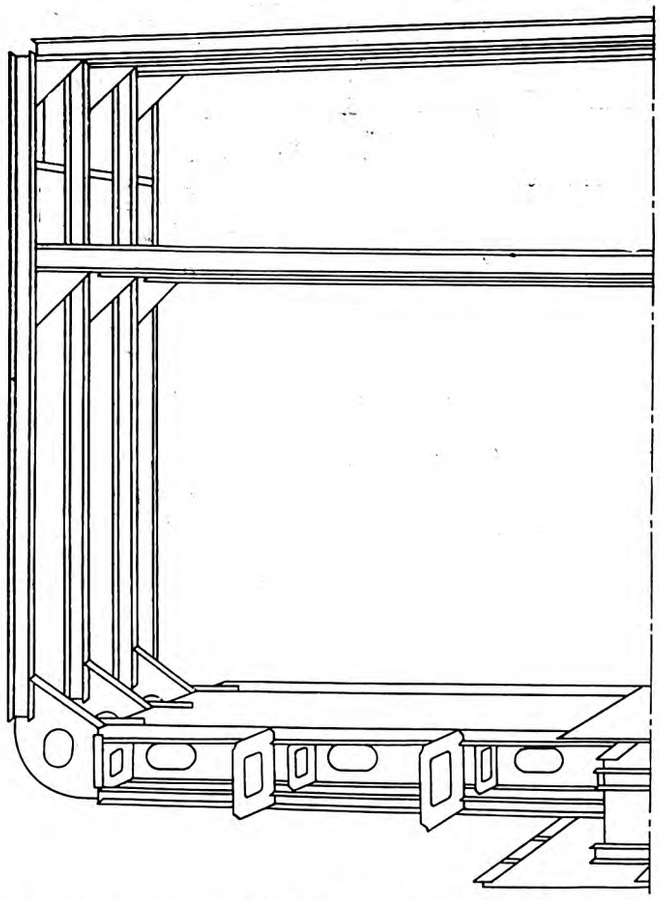

Fig. 65.—Structural Details, 9,600-Ton Fabricated Steel Steamship

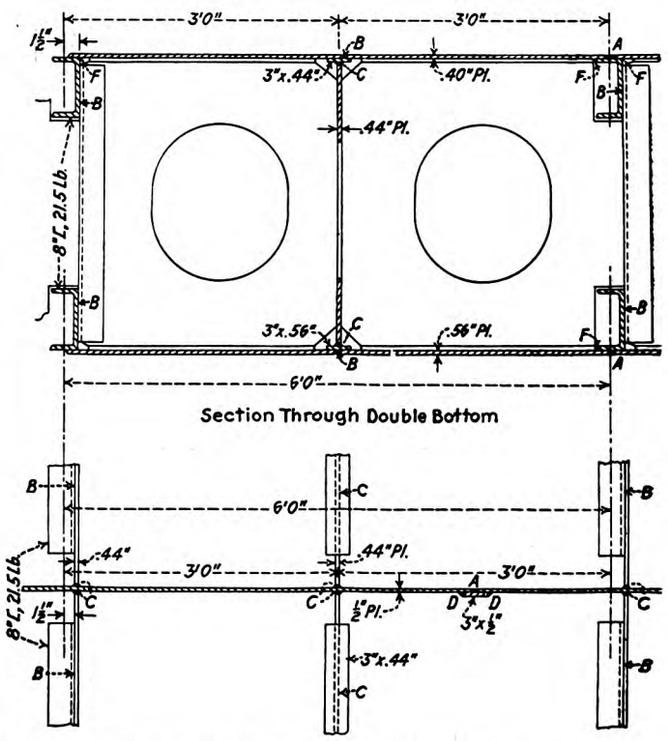

Fig. 66.—Center Keel and Floor Connections, 9,600-Ton Fabricated Steel Steamship

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by using wide plating, large portions of the framing can be welded to plates in the shop.

Sir J. W. Isherwood states: "I am a great believer in the future of electric arc welding and sincerely trust that the process like some other innovations will not get a 'set back' by attempting too drastic changes in the existing methods of building ships." He further states that spot welding might be used to advantage for some of the ground work similar to the present use of hydraulic riveting, but means must be found for clamping parts together before the use of spot welding machines can be adopted.

This Isherwood design which was prepared with the co-operation of Sir W. S. Abell, chief surveyor of Lloyd's Register of Shipping, is such that any ordinary shipyard could readily handle it, and in general, service bolts are used for temporarily holding the various members together prior to welding. We further quote Sir Joseph Isherwood. "It will be observed from the midship section that the general disposition of material does not differ from that of a riveted ship. There are no large pieces to handle, therefore, no special lifting facilities required, but such shipyards as can conveniently handle sections could complete large sections on the ground."

Overhead Welding

The difficulty of doing "overhead" welding has been strongly emphasized by welding experts, and this has been kept in view, and obviated, at any rate, in so far as strength welds are concerned. On the wide plating three longitudinals are fitted and are butted at the shell butts in order that the longitudinals can be welded to the plates on the ground. The clips of the transverse members being in short pieces are also welded to the plates on the ground. The seams and butts of bottom plating are butted and fitted with outside straps. The seams of side plating are arranged clinker fashion to obviate overhead strength welding.

The vertical stiffeners on the floors are fitted in the shop, and in cases like this where only an odd hole or two could be saved by welding, it is suggested that riveting be adopted. The same remarks apply to horizontal clips on side transverses and so on.

Longitudinal and transverse attachment angles are welded to the plates in the shop similar to the bottom plates. The gunwale bar is also welded to the sheer strake before erection. So is also the top margin angle welded to its side shell plate. The side transverse members and deck beams are assembled and welded on the ground in such sections as are convenient to handle.

Process of Construction

The process of erection and the welding to be done in the ship might be briefly described, bearing in mind that no special facilities of any kind are required for handling the material beyond what would be in use in an ordinary shipyard able to build riveted ships of this size.

Keel plates are laid as usual. They have already welded to them angle bars to take the center girder and the outside straps in way of seams and one end. The plates for the next strake are brought into position; they having in addition to longitudinal and transverse framing clips, edge strips at one edge to form a seam for the adjoining strake and edge strips at one edge of each plate to form the butt of the next plate.

After all the bottom plates are in position, floors are erected and secured to the longitudinal by bolts through the outstanding flanges of the vertical angles on the floors. Then tank top plates are laid in position and all parts faired up, after which all joints are welded. Transverse framing, beams and sheer strakes are now erected and faired, permitting shell plating to be put up. The deck plates with the longitudinals already welded on are dropped in position

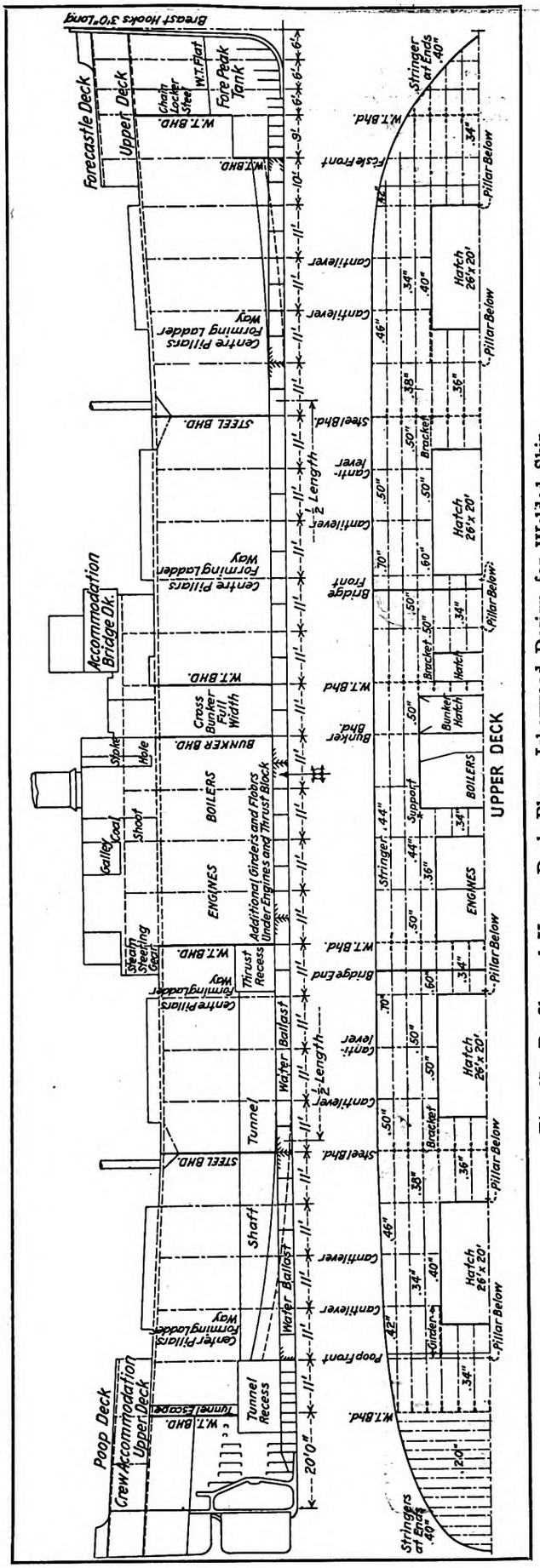

Fig. 67.—Profile and Upper Deck Plans, Isherwood Design for Welded Ship

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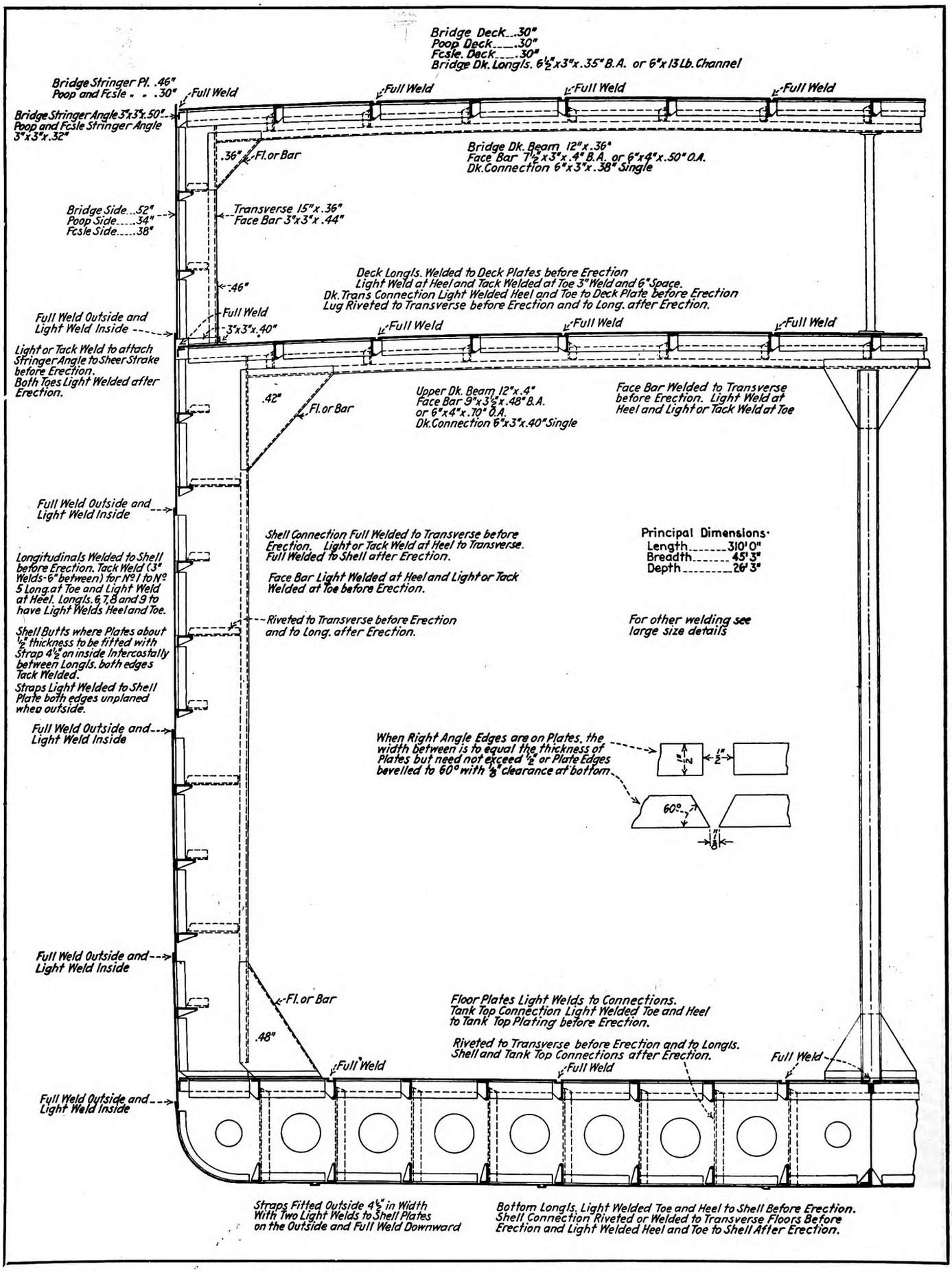
Bridge Deck...30"
Poop Deck.....30"
Fcsle. Deck.....30"
Bridge Dk. Longls. 6½"x3"x.35" B.A. or 6"x13 Lb. Channel
Bridge Stringer Pl. .46"
Poop and Fcsle . . .30"
Full Weld
Bridge Stringer Angle 3"x3"x.50"
Poop and Fcsle Stringer Angle 3"x3"x.32"
.36"
Fl. or Bar
Bridge Dk. Beam 12"x.36"
Face Bar 7½"x3"x.4" B.A. or 6"x4"x.50" O.A.
Dk. Connection 6"x3"x.38" Single
Bridge Side...52"
Poop Side.....34"
Fcsle Side.....38"
Transverse 15"x.36"
Face Bar 3"x3"x.44"
Deck Longls. Welded to Deck Plates before Erection
Light Weld at Heel and Tack Welded at Toe 3" Weld and 6" Space.
Dk. Trans. Connection Light Welded Heel and Toe to Deck Plate before Erection
Lug Riveted to Transverse before Erection and to Long. after Erection.
.46"
Full Weld Outside and Light Weld Inside
3"x3"x.40"
Light or Tack Weld to attach Stringer Angle to Sheer Strake before Erection.
Both Toes Light Welded after Erection.
.42"
Upper Dk. Beam 12"x.4"
Face Bar 9"x3½"x.48" B.A.
or 6"x4"x.70" O.A.
Dk. Connection 6"x3"x.40" Single
Face Bar Welded to Transverse before Erection. Light Weld at Heel and Light or Tack Weld at Toe
Shell Connection Full Welded to Transverse before Erection. Light or Tack Weld at Heel to Transverse.
Full Welded to Shell after Erection.
Face Bar Light Welded at Heel and Light or Tack Welded at Toe before Erection.
Principal Dimensions
Length.....310' 0"
Breadth.....45' 3"
Depth.....26' 3"
Longitudinals Welded to Shell before Erection. Tack Weld (3" Welds-6" between) for No 1 to No 5 Long. at Toe and Light Weld at Heel. Longls. 6, 7, 8 and 9 to have Light Welds Heel and Toe.
Riveted to Transverse before Erection and to Long. after Erection.
For other welding see large size details
Shell Butts where Plates about ½" thickness to be fitted with Strap 4½" on inside Intercostally between Longls. both edges Tack Welded.
Straps Light Welded to Shell Plate both edges unplaned when outside.
When Right Angle Edges are on Plates, the width between is to equal the thickness of Plates but need not exceed ½" or Plate Edges bevelled to 60° with ⅛" clearance at bottom.
60°
.48"
Fl. or Bar
Floor Plates Light Welds to Connections.
Tank Top Connection Light Welded Toe and Heel to Tank Top Plating before Erection.
Riveted to Transverse before Erection and to Longls. Shell and Tank Top Connections after Erection.
Straps Fitted Outside 4½" in Width With Two Light Welds to Shell Plates on the Outside and Full Weld Downward
Bottom Longls. Light Welded Toe and Heel to Shell Before Erection.
Shell Connection Riveted or Welded to Transverse Floors Before Erection and Light Welded Heel and Toe to Shell After Erection.

Fig. 68.—Midship Section, Isherwood Design for Welded Ship

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and all parts ready for final welding. I wish to draw attention to the very small amount of welding to be done on the ship after erection.

Full welds of double bottom for: Butt seams, butt straps and butts of longitudinals, connection of center keelson plate top and bottom.

Light welds of double bottom for: One edge of outside seam strap, top and bottom of floor plates and transverse clips.

If the service bolt holes in the seams and butts are fitted with plugs and welded and the small connections at the intersection of the longitudinals with the floor plates are

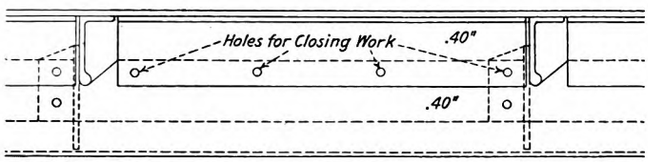

Fig. 69.—Upper Deck Transverse Beam, Isherwood Design for Welded Ship

welded, then all riveting in the double bottom of the ship is obviated. It is assumed that the service bolt holes for the work done in the shop and on ground were filled up before material was brought to the ship and before erection.

Full welds of side plating and internal work: outside edges of shell overlaps, butts of shell plates and longitudinals, connection of transverse plates to shell clips and inner bottom plating.

Light welds of side plating only for inside edges of shell overlaps.

Full welds are used for seams of deck plating, butts of deck plating and longitudinals, heel of gunwale bar and connections of beams to transverse framing.

Light welds for connection of transverse beam plates to slips already on deck and for pillar and detail work.

Mr. H. Jasper Cox, in his paper read before the Society of Naval Architects and Marine Engineers, comments on the Isherwood design of welded ship, as follows:

"The system of construction lends itself to a large proportion of the total welding being done prior to erection, and in working out the details, no attempt has been made towards an unreasonable amount of elimination of bolting or riveting. For instance, the longitudinals are attached to

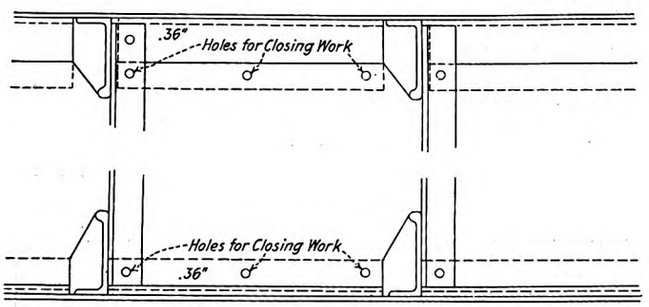

Fig. 70.—Transverse Floor at Shell and Tank Top, Isherwood Design for Welded Ship

the shell plating by service bolts spaced 12 inches apart and are welded at the toe and heel by continuous light welds; then the bolts are removed and rivets or welded studs fitted. In other parts, where the minimum number of bolts necessary to properly tighten up the work approaches the total number of rivets required in a riveted ship, the designer has simply added the extra rivets instead of attempting to weld."

Further details of construction can be found by studying the accompanying plans kindly furnished me by Sir J. W. Isherwood.

THE CALDWELL ALL ELECTRICALLY WELDED BARGE

Major James Caldwell, managing director of the Alloy Welding Processes, Ltd., London, has prepared a design for an all electric arc welded barge using the conventional transverse frame ship design with certain modifications in details of construction. This design is based on the experience gained from the building at Richborough Dockyard of the barge previously described and known as the *AC-1320*.

The principal dimensions of Major Caldwell's barge are

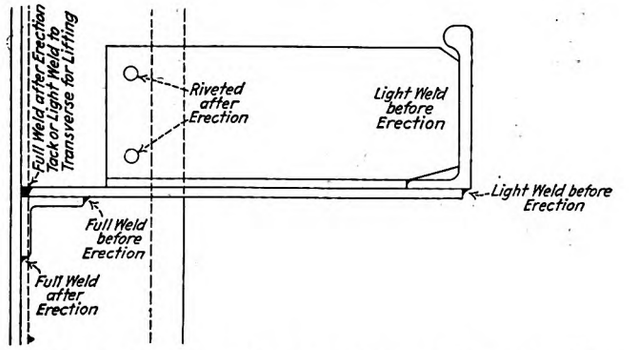
Full Weld after Erection Tack or Light Weld to Transverse for Lifting
Riveted after Erection
Light Weld before Erection
Light Weld before Erection
Full Weld before Erection
Full Weld after Erection

Fig. 71.—Section Through Side Stringer, Isherwood Design for Welded Ship

length between perpendiculars 125 feet 3 inches, molded breadth 16 feet 5 inches, molded depth 8 feet 6 inches. Displacement at 5 feet 3 inches draft is 280 tons and on 6 feet 0 inch draft 320 tons. The propelling machinery is an 80 horsepower, 2 cylinder, 4 stroke oil engine, weighing 5 tons. Total weight of the barge is estimated at 80 tons.

Major Caldwell states that the principles governing the substitution of arc welding for riveting in the construction of a ship are as follows:

1. Obtaining equivalent strength.
2. Minimum of overhead welding.
3. Ease of repair.

In commenting on these three basic principles of design,

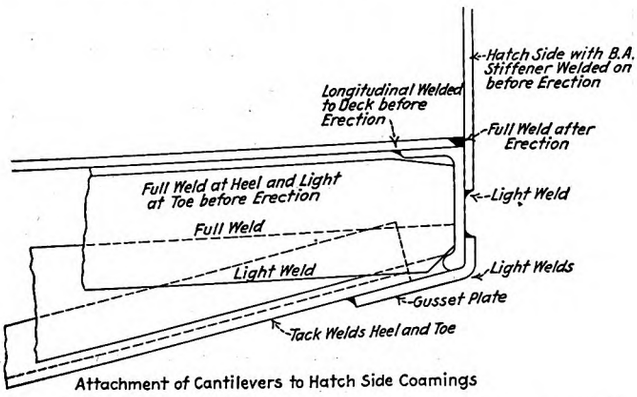
Hatch Side with B.A. Stiffener Welded on before Erection
Longitudinal Welded to Deck before Erection
Full Weld after Erection
Full Weld at Heel and Light at Toe before Erection
Light Weld
Full Weld
Light Weld
Light Welds
Gusset Plate
Tack Welds Heel and Toe
Attachment of Cantilevers to Hatch Side Coamings

Fig. 72.—Attachment of Cantilevers to Hatch Side Coamings, Isherwood Design for Welded Ship

he states: "Tensile and alternating stress tests repeatedly carried out during the last twelve months on ship plates welded with covered electrodes have shown that compared to equivalent riveted joints, the arc welded joint is consistently superior in ultimate strength, and is, moreover, water and air tight up to its breaking point, whereas a riveted and calked joint fails in watertightness at 10 percent of its breaking load. It is sufficient for the purpose of this report to state that in plates up to ⅜ inch thickness a continuously welded lap joint is about 100 percent stronger in tensile strength

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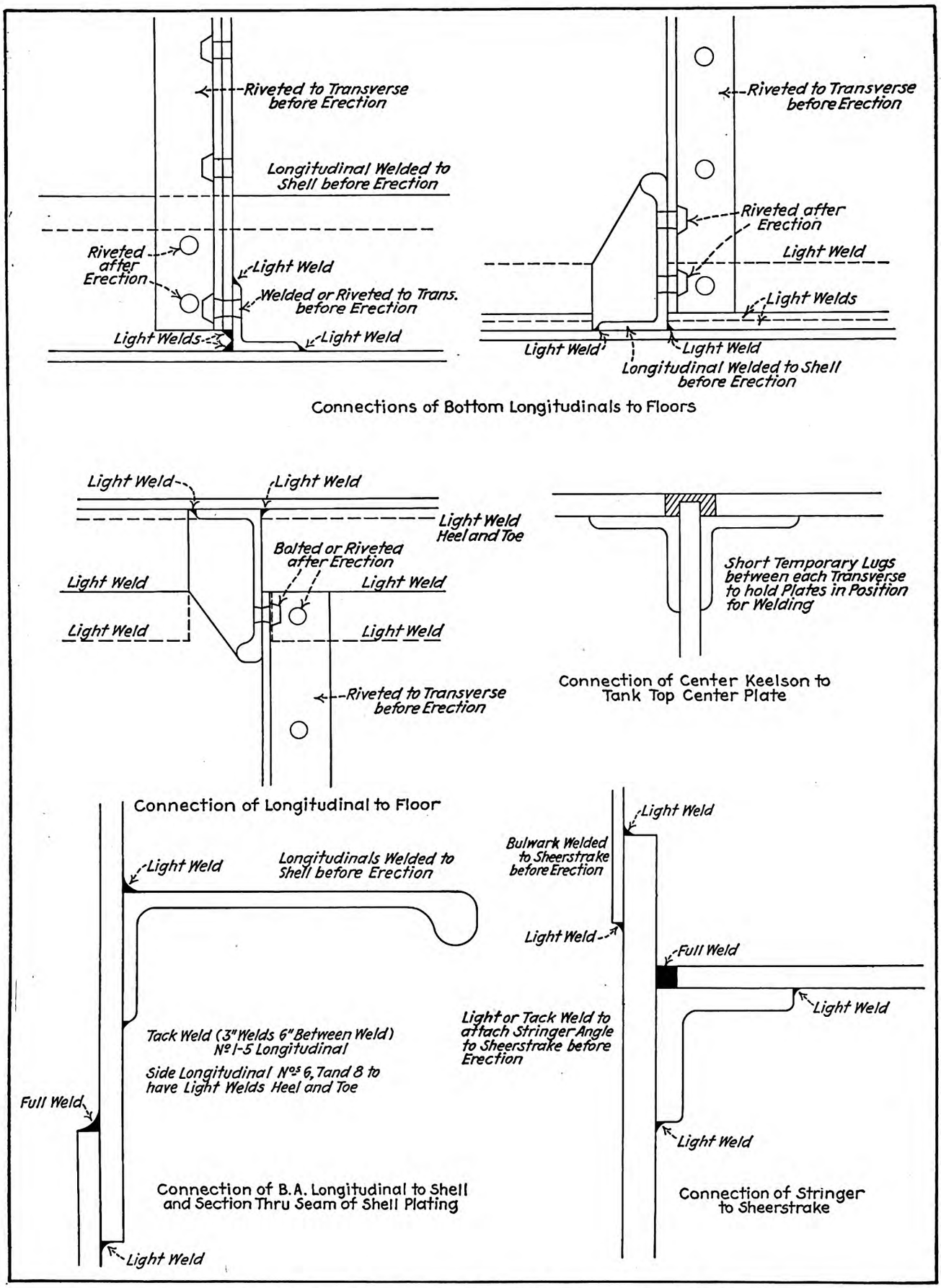
Riveted to Transverse before Erection
Longitudinal Welded to Shell before Erection
Riveted after Erection
Light Weld
Welded or Riveted to Trans. before Erection
Light Welds
Light Weld
Riveted to Transverse before Erection
Riveted after Erection
Light Weld
Light Welds
Light Weld
Light Weld
Longitudinal Welded to Shell before Erection
Connections of Bottom Longitudinals to Floors
Light Weld
Light Weld
Light Weld Heel and Toe
Bolted or Riveted after Erection
Light Weld
Light Weld
Light Weld
Light Weld
Riveted to Transverse before Erection
Connection of Longitudinal to Floor
Short Temporary Lugs between each Transverse to hold Plates in Position for Welding
Connection of Center Keelson to Tank Top Center Plate
Light Weld
Light Weld
Longitudinals Welded to Shell before Erection
Tack Weld (3" Welds 6" Between Weld) Nº 1-5 Longitudinal
Side Longitudinal Nºs 6, 7 and 8 to have Light Welds Heel and Toe
Full Weld
Light Weld
Connection of B.A. Longitudinal to Shell and Section Thru Seam of Shell Plating
Light Weld
Bulwark Welded to Sheerstrake before Erection
Light Weld
Full Weld
Light or Tack Weld to attach Stringer Angle to Sheerstrake before Erection
Light Weld
Light Weld
Connection of Stringer to Sheerstrake

Fig. 73.—Details of Construction, Isherwood Design for Welded Ship

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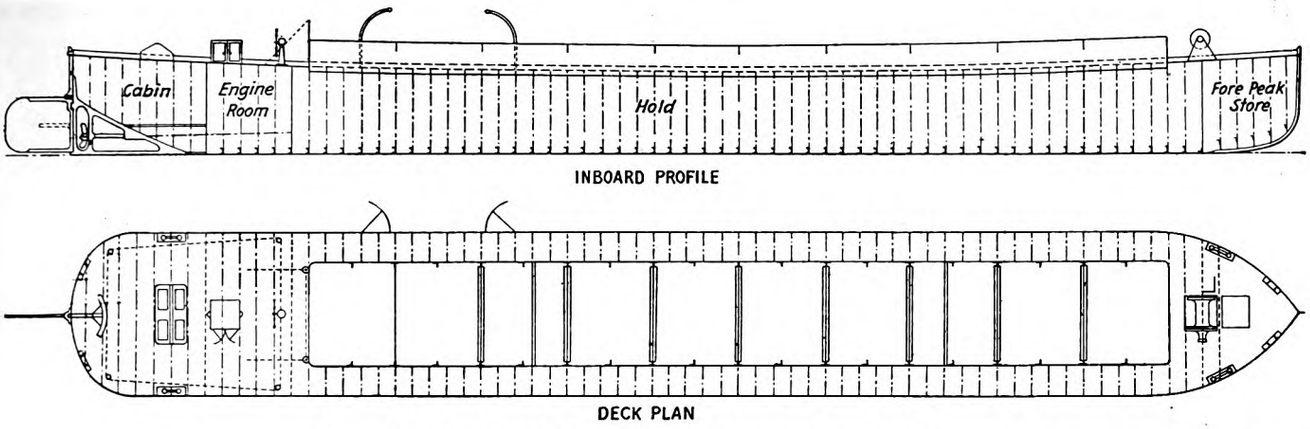

Fig. 74.—Profile and Deck Plan, Caldwell Arc Welded Barge

than a standard riveted lap joint and it is estimated that in no part of the design are the welded joints less than 50 percent stronger than the equivalent riveted joint.

Overhead Welding

Welding in an overhead position increases labor cost owing to the slower speed obtainable and the tiring of the operators. Reliable welds can be made in this position where the necessary headroom is available, but in cramped positions it is difficult. For economical reasons it should be avoided where possible. Careful attention has been given to this point in this design and overhead welding is avoided to a considerable extent by suitable arrangements of the joints

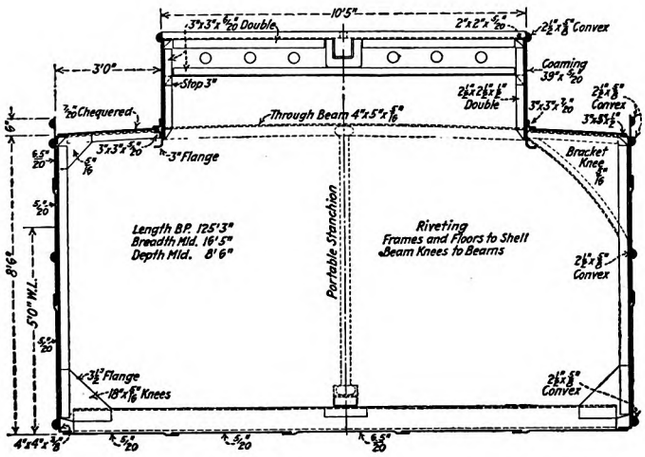

Fig. 75.—Midship Section, Caldwell Arc Welded Barge

and the adoption of a carefully planned system of fabrication of sections before erection. When overhead welding is unavoidable, plenty of headroom is available and the weld is in an easily accessible position.

Before adopting an all welded design of construction careful consideration was given to the question of probable repairs arising from the usual risk of collision and going ashore.

No difficulty is foreseen in cutting out damaged and holed plating with welded laps either by pneumatic tools, oxy-acetylene blow pipe or cutting arc, and the replacement of such plates by welding would be a very simple and satisfactory job. The removal of plates welded to frames and floors is not such a simple matter and there is risk of damage to such frames and floors during the operation of cutting out. I have, therefore, very carefully considered and discussed with engineers of extensive experience in ship repair the relative merits of welding and riveting for the general attachment of plating to frames and floors. As a result, it has been decided that the advantage of welding considerably outweighs the risk I have mentioned which should not occur unless unskilled labor is utilized. As a further precaution, I suggest the introduction of "attachment" strips between frames and plating, which would bear the whole force of possible damage when plates were cut away and replaced by new plating welded to the hull. However, as a result of experience, should it be found preferable for this work to be riveted this method could be adopted without alteration of design.

The superiority of continuous welded joints over equivalent riveted joints in both tensile and shear stresses is so marked that considerable economy in the amount of welding has been obtained by substituting "tack" welding (spaced welds of short lengths) for continuous welding wherever possible without sacrificing the factor of safety in any way. On shell, bottom and deck plating, and watertight bulkheads, continuous welding is adopted to ensure watertightness. For the shell seams the plates are joggled with continuous welds on both edges. For the vertical joints, butt straps are used of light section with continuous butt weld between plates and tack welded between straps and plates.

In general, all watertight work is continuously welded, and non-watertight work tack welded.

In connection with erection the assembly of fabricated sections of the barge on the ground for subsequent erection on the ship has such manifest advantages in enabling the welding to be carried out in the easiest position thereby reducing overhead welding and facilitating inspection that it should be adopted to the greatest possible extent.

Welded construction adapts itself well to such fabrication as well as the use of jigs and templates for rapid production of repetition work such as frames, floors, bulkheads, etc.

Scheme of Fabrication

The following scheme of fabrication is estimated to facilitate welding operations and decrease labor cost.

Frames, floors, frame beam and bracket knee and center keelson lugs to be tack welded in the field and erected in one piece.

Deck plating in way of hatches to have half beams, gunwale bar, deck coaming bar and alternate butt straps welded in the field and erected in sections.

Deck plating clear of hatches to be welded on the ship.

Hatch coaming plates to be erected with stiffeners, beam lugs, hatch cleats, molding and hatch cover rest bars all welded.

Side shells to have seams with a continuous fillet weld out-

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side and continuous light weld inside but moldings and alternate butt straps should be welded onto the plates before erection.

Bottom shell laps to have continuous strength weld inside and light weld on outside.

All shell plates butt welded on ship with inside strap tack welded on outside.

The calculated total welding on this vessel is equal to 9,000 feet of continuous welding on 5/16 inch plating. Of this amount 4,000 feet can be performed in the field under the best conditions leaving 5,000 feet to be carried out in position on the ship after erection.

The regulations governing welded ship construction as laid down by Lloyd's Register of Shipping provide for efficient supervision of welders, and maximum and minimum current densities in the electrode.

Minimum throat thickness of fillet welds, etc., are also insisted upon and are easily checked.

The Paraffin Test

Further it is proposed to use the paraffin injection test on watertight joints. This test which consists of projecting paraffin against the line of welding with a syringe has already proved an exceedingly useful and efficient method of detecting porous and unsound welds in the construction of welded tanks, etc.

This barge design was worked out by Mr. G. Rowell, naval architect, employed at the Richborough Dockyard during the building of the Barge *AC*-1320.

Accompanying copies of plans of Major Caldwell's barge will furnish further detail information.

(To be continued)

Mechanical Oil Burner Designed with Self-Contained Forced Draft

THE latest type of mechanical atomizing oil burner, the Mayflower design, developed by the Babcock and Wilcox Company, New York, incorporates a self-contained forced draft system.

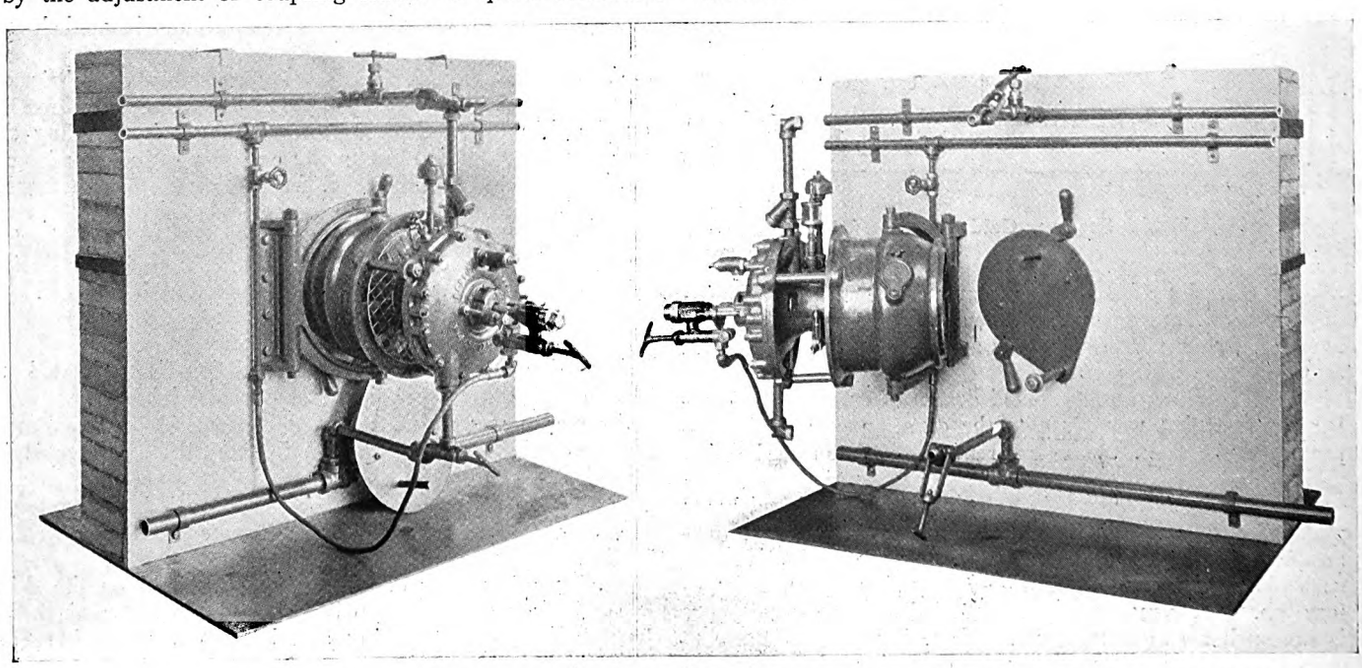
The burner consists of the main casting with a bladed cone, to which a hollow shaft turbo blower is attached. The atomizer fits through the blower shaft and may be moved in and out by the adjustment of coupling studs. A quick detachable yoke and coupling, similar to that used on other Babcock and Wilcox types of burners is also fitted to the atomizer. An impeller blade is fastened to the bladed cone by means of lugs. Access may be gained to the furnace by swinging aside the burner which is hinged. This also provides for the insertion of a fire tile plug which is put in place when the burner is not in use. Steam connections to the turbine are detachable and somewhat similar to the quick detachable yoke and coupling used on the oil burner connection.

The special advantages claimed for the burner are that on forced draft work it eliminates all ducts as well as the large blowers supplying air to the ducts; further, any number of burners can be run independently without having air leakage through dead burners, as is sometimes found when double front construction is used. As the air for combustion can be regulated very closely to the required amount, owing to the multiplicity of speeds available with the turbo blower, higher efficiency can be obtained.

When installing these burners, the steam piping can be so arranged that one master valve on the steam supply to the turbines regulates the air supply to all burners in operation with but a single adjustment. The oil supply to all burners can also be regulated by a master valve located adjacent to the steam master valve. By this method, one man can control any number of units obtaining the correct combustion with the minimum amount of work.

This type of burner has been thoroughly tested by the United States Navy at the fuel oil testing plant of the Philadelphia Navy Yard and found satisfactory.

S. S. Cleveland to Be Cabin Ship.—The steamship *Cleveland,* recently acquired by the United American Lines, is at the Blohm and Voss shipyard at Hamburg, Germany, where she is being reconditioned and converted to an oil burner prior to entering regular service as a cabin ship. Her first and second class accommodations are being combined into a single cabin class. When the work is completed the vessel will accommodate approximately 500 cabin class passengers and 700 third class passengers in rooms. Captain E. C. Tobey, vice-president in charge of operations for the United American Lines, is in personal charge of the reconditioning of the ship. The *Cleveland* will take up regular sailings between New York, Cherbourg, Southampton and Hamburg this fall.



Mayflower Burner in Operating Position with Steam and Oil Lines Connected (left); with Burner Swung Away from Front for Inspection (right.)

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Turbine Electric and Geared Turbine Drive

All Factors Affecting a Particular Ship Should Be Considered Before Selecting Type of Propelling Machinery

By W. C. Watson and John Thomas*

AFTER reading Mr. Shaw's article headed "An Analysis of the Claims of the Electric Drive over the Geared Drive," which appeared in the July issue of MARINE ENGINEERING AND SHIPPING AGE, a few readers of this magazine no doubt have gained the impression that the General Electric Company is advocating turbine electric drive for all types and sizes of steamships. It appears that Mr. Shaw has misunderstood the purpose of our article headed "How to Get a Shaft Horsepower Hour for All Purposes with Steam on from 0.75 to 1.00 Pound of Oil," which appeared in the May issue of MARINE ENGINEERING AND SHIPPING AGE, and was written to inform the marine fraternity of the possibilities to be obtained through the use of turbine electric form of propulsion.

Mr. Shaw has made the statement that the article was conspicuous due to absence of detail data to substantiate the claims made for this form of propulsion. However, the data have been thoroughly discussed and approved by reliable shipbuilders and ship operators in this country and abroad, and we would be pleased to forward copies of the detail calculations to any interested parties, as they were purposely left out of the article on account of the mass of detail involved.

MANUFACTURES THREE TYPES OF SHIP MACHINERY

The General Electric Company is engaged in the study and manufacture of Diesel electric, turbine electric and geared turbine propulsion machinery for ships, and is attempting to determine the proper installation for each particular ship.

DIESEL ELECTRIC DRIVE

A number of vessels have been equipped with Diesel electric propulsion apparatus, trial results of which indicate that the future for this type of drive is very promising. Further discussions will appear in later publications.

GEARED TURBINE DRIVE

The General Electric Company has been engaged in the design and manufacture of marine geared turbines for eight years, and has built over 2,000,000 horsepower of which approximately 1,300,000 horsepower has been installed in destroyers and is of the single reduction type corresponding to 1,000,000 horsepower manufactured by the William Cramp and Sons Ship and Engine Building Company as referred to by Mr. Shaw. While these reduction gears furnished by both companies have given no trouble, all marine engineers appreciate that equipments of this type are only suitable for vessels where full power is seldom employed, and are not suitable for cargo and passenger ships when efficient propeller speeds are employed. In addition to these single reduction gear equipments, the General Electric Company has equipped 322 merchant ships involving approximately 800,000 horsepower of the double reduction type. While 12 of these vessels were sunk during the war and 34 have had machinery replacements, the average mileage steamed by the remaining 288 vessels is approximately 93,000 miles each, and today about 200 of the geared turbine vessels in actual operation under the American flag are equipped with General Electric Company double reduction geared turbine machinery. Ninety-eight of these vessels have steamed an average of 120,000 miles each without gear replacements.

* Marine department, General Electric Company, Schenectady, N. Y.

Although thoroughly reliable double reduction geared turbine equipment can now be obtained for cargo vessels requiring from 2,000 horsepower to 4,000 horsepower per propeller shaft, no marine engineer should attempt to specify one type of propelling machinery for all steamships. Turning to larger passenger and cargo vessels, our experience and knowledge of the problems encountered lead us to believe that a greater degree of success can be encountered with the turbine electric drive than with any other form of propulsion. There are certain cases in the smaller powered steamships where flexibility of control and other considerations influence the marine engineer in favor of turbine electric drive.

TURBINE ELECTRIC DRIVE

The problem of comparing the results of two vessels equipped with different types of propelling machinery is extremely difficult, even when the vessels are of the same type. Mr. Shaw has presented certain curves to prove superiority of geared turbines over turbine electric propulsion, and in so doing has compared a 32,000-ton displacement, 28,000-shaft horsepower, 21-knot battleship with a 7,600-ton displacement, 90,000-shaft horsepower, 35-knot light cruiser. It would appear to us that it would be just as practical to compare the performance of the 1,800-horsepower 71-knot motorboat *Miss America 2nd* with the 4,200-intermediate horsepower 11½-knot motorship *William Penn.*

In either case the boats are of entirely different types and designed for entirely different service, and the machinery for one would be unsuitable for the other without extensive alterations, which would materially change the results. Furthermore, the electric drive battleships have four screws instead of two, as mentioned by Mr. Shaw. We believe that a comparison of electric drive battleships with the only geared turbine battleship in the U. S. Navy, the *North Dakota,* would have been more valuable to readers of MARINE ENGINEERING AND SHIPPING AGE, but while the electric driven vessels show a marked improvement in fuel consumption over this battleship, we will not include a comparison as the *North Dakota* has certain machinery details which might make a comparison misleading.

EFFICIENCY AT CRUISING SPEEDS

Mr. Shaw has made the claim that the geared turbine machinery is far superior to turbine electric drive at cruising speeds, and while marine engineers appreciate that geared turbine installations can be designed for as efficient operation as electric drive at a definite speed, all fair comparisons have shown that the turbine electric drive is superior at reduced power when more than one turbine generating set is employed. This has again been confirmed by recent studies of electric drive for naval vessels for various navies of the world. At several different speeds it is possible with the electric drive to shut down all but one main generating unit and turn all propellers with this one unit and to maintain at least half speed of the vessel. Pole changing propulsion motors are usually installed in such ships, which enable the operator to run the one main generating unit at efficient speeds during cruising operation of the ship. On the other hand, with the geared turbine installation it is necessary to operate practically all of the engine room machinery at cruising speeds, which also makes it difficult to make repairs to most of the machinery while the ship is under way.

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FUEL CONSUMPTION

There has been considerable discussion concerning the fuel consumption of the five turbine electric driven vessels of the *Eclipse* type, and Mr. Shaw included a few figures on their operation. During the war there came a time when the mechanical drive facilities of the country were fully employed. Since the building of engines was the limiting feature of the shipbuilding program, the Emergency Fleet Corporation turned to turbine electric drive as a way of increasing the output of propulsion machinery. The five electric ships of the *Eclipse* type were the only cargo boats equipped with the turbine electric drive as a result of that program. The propulsion turbines, generators and motors installed in these vessels were accurately tested at the factory at the time of manufacture, where the most refined measuring apparatus was employed and there is no doubt as to actual steam consumption of these units. No material improvement in fuel consumption over that of good geared turbine installations could be expected, and the ships have been studied by the advocates of electric drive primarily from the viewpoints of reliability and low cost of upkeep. The same boilers, which were not the most suitable for superheaters, and the original auxiliaries were maintained at the time the geared turbines were removed to permit installation of electric drive.

FIRST ELECTRIC DRIVE CARGO BOATS

It should be recognized that these were the first electric drive cargo boats in this country, and while they are not well balanced installations and do not represent what can be done today, the average fuel consumption of the *Archer* is approximately 1.16 pounds of oil per shaft horsepower hour for all purposes, as mentioned by Mr. Shaw, which is as good as the average geared installation and all that one could expect on this particular ship. The performance of these five cargo boats, as well as the performance of naval vessels and the four Coast Guard cutters of the *Tampa* type, has demonstrated without question the reliability of the turbine electric propulsion machinery, and has also established the fact that the maintenance expense is less than for any other form of ship drive. The turbine electric drive has proven itself extremely popular with the crews, and chief engineers have made the statement that they consider it easier to go to sea with a green crew on an electric ship than with any other form of propulsion.

The possibility of short circuits in the electrical machinery is very remote, and if they do occur, are not liable to disable the vessel. All live parts are well protected and contact with them is very difficult unless purposely done. The selection of the induction or synchronous type of propulsion motor depends entirely upon the application, and Mr. Shaw's statements concerning these types of motors are somewhat misleading. No attempt has been made by electrical experts to establish the synchronous motor as the most suitable for all propulsion applications.

No serious concern has been exercised over the smaller air gap of the induction motor, as experience over a period of ten years has shown that the induction motor is entirely suitable for such work. Both induction and synchronous motors have advantages for marine propulsion. The synchronous motor now offered by the General Electric Company primarily for the propulsion of single speed vessels might better be called a synchronous induction motor, as it combines the essential characteristics of each type. It is maneuvered as an induction motor and is operated as a synchronous motor at unity power factor only for steady running ahead or astern. Furthermore, this motor can be operated continuously at approximately half speed as a squirrel cage induction motor.

EITHER TYPE OF MOTOR EFFICIENT

Based on the performance of six ships equipped with the synchronous motor drive and a number provided with induction motors, there is no pronounced tendency for either type of motor to fall out of step under any conditions encountered at sea. The accessibility of parts for any repairs that have to be made is the principal advantage of the synchronous over the induction motor, but there is also some saving in weight and a slight advantage as regards efficiency.

In conclusion we wish again to point out that no type of drive can be recommended for a particular ship until all factors have been considered, and no single type of drive can be recommended for all seagoing vessels.

Steamer Wrongfully Libeled

THE plaintiff libeled the *Consuelo,* a Spanish steamship of steel construction, and caused an attachment to be issued against the ship, as a result of which she was arrested and taken into possession by the marshal and held, but was later voluntarily released when the plaintiff learned that their claim was against a French vessel of wood construction which bore the same name. The Court in Artinano vs. W. R. Grace & Company, American Maritime Cases Vol. 1, page 546, said that in an action at law, one who in error libels in a foreign port a vessel which bears the same name as another vessel against which he has a claim, but which is otherwise in every outward characteristic totally different and readily distinguishable from the vessel which he is pursuing, shows such gross negligence, similar to malice, as to become liable for actual damages flowing from the detention.

THE BOARD OF CITY COMMISSIONERS, Bayonne, N. J., has received a proposal which contemplates a huge marine and industrial terminal at that city, to cost $150,000,000, with warehouses, piers and railroad terminals.

Aeroplane View of United States Aeroplane Carrier Langley

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Depression Leads British to Urge Government Aid

Scheme to Assist Shipowners to Replace Obsolete Vessels Proposed—Loans on New Ships and Bounties Suggested

By a Special English Correspondent

IF certain factors may be taken as reliable indications—and, so far as I can see, there is no reason why they should not—the shipping industry of the United Kingdom, and with it, presumably, that of other leading maritime nations, is in for what is universally known as "a lean time." The root of the trouble seems to lie in the international, political, economic and financial conditions which continue to obtain, and unhappily there is, at this writing, little sign of improvement. The quarterly figures which the Chamber of Shipping have now issued, covering the laid-up tonnage in the principal ports of the United Kingdom, show how the grip of the depression tightened during the second quarter of the year, the laid-up tonnage on July 1, having increased by as much as 30 percent as compared with April 1. The Chamber's figures relate to British and foreign shipping, and the extent of the fluctuations over a period exceeding twelve months will be seen at a glance from the following:

TONNAGE LAID UP AT THE PRINCIPAL PORTS OF THE UNITED KINGDOM

	England and Wales.		Scotland.		Ireland.		Total.	
Date, 1922.	No.	Net tons.	No.	Net tons	No.	Net tons.	No.	Net tons.
April 1 ..	394	699,977	67	98,089	23	38,553	484	836,619
July 1 ...	476	910,553	53	91,247	54	110,532	583	1,112,332
Oct. 1 ...	377	666,999	41	62,581	38	95,044	456	824,624
1923.								
Jan. 1 ...	353	633,818	37	86,153	21	12,227	411	732,198
April 1 ..	282	492,054	27	52,146	12	2,355	321	546,555
July 1 ...	324	636,774	27	63,853	21	8,475	372	709,102

POOR REPORTS FROM OLD-ESTABLISHED SHIPPING COMPANIES

There is another indication of the disquieting situation in which the shipping trade finds itself, and that is in regard to the annual reports and balance-sheets of the principal companies, which documents have lately been published in rather a bunch. Frankly, the results shown in some of these accounts are undeniably poor. Take, as an example, the old-established Anchor Line (Henderson Brothers), Ltd., whose profits during the past year amounted to only £23,238, being a reduction of no less than £127,000 as compared with the previous year and of £172,000 as compared with two years ago. The result is, indeed, the poorest since 1908-9, when the company sustained a loss of £16,000. The directors of the line make no secret of the fact that the conditions which ruled in the shipping industry during the currency of the report have been the worst for many years past.

Another well-known shipping concern whose earnings are a good deal below the level of previous years is Furness, Withy and Company, Ltd., the profits during the past financial year amounting to only £552,510, as compared with £655,206 a year ago, and slightly more than a million sterling in the year ending April, 1920. The directors, pursuing their policy of conservatism, have set aside £200,000 for depreciation the same as a year ago, and have reduced the dividend and bonus distribution from 10 percent to 7½ percent. Fortunately the company is in an excellent financial position, and it is by no means dependent on shipping for its livelihood, for its interests extend to insurance and many other branches. Indeed, were it not for some of these subsidiary operations the company might have been hard put to make anything like a good showing this year, because a substantial proportion of the earnings were contributed by these "outside" bodies.

ACCOUNTS OF LARGEST CARGO CARRYING COMPANY

Touching on shipping accounts, the figures of the St. Just Steamship Company, Ltd., Cardiff, managed by Sir William Reardon Smith and Sons, Ltd., make particularly interesting reading, for the concern owns the largest cargo carrying fleet of any company in the United Kingdom, with the possible exception of one or two companies whose interests are linked up with leading liner companies. Unfortunately the accounts of the St. Just Company are presented in such a way that it is impossible to ascertain what the profits amounted to in the nine months covered. No alarm need be felt on this score, however, for it is the exception to the rule for British shipping companies to convey in their accounts anything like a real impression of the financial results of the services conducted. The history of this company, as vouched for by the managers, is certainly an interesting one, and serves the useful purpose of illustrating the fluctuations assailing shipping enterprises. The company was formed at the end of 1912 and commenced trading in April, 1913. The original capital of the company was £90,000, which was increased from time to time up to March, 1919, by several increases of capital and by amalgamation. The total cash subscribed by shareholders was £645,000, the balance of the present capital of £2,064,000 being by way of bonus shares. In addition, however, to the bonus shares, the shareholders have received dividends calculated on their actual cash investment at an average rate of over 15 percent per annum, free of tax.

LOOKS LIKE A SUBSIDY

So much for the past. Reverting to the current year, the directors have reduced by £500,000 the cost of the steamships and investments, less reserve for depreciation. That sounds like a fine achievement, but obviously this half-a-million sterling was not written off from earnings of £91,-604. The sum is believed, however, to have been obtained from the Government in connection with the agreement that it should pay part of the increased cost of steamers ordered during the war, such increase having been contributed to or caused by the action of the Government in delaying completion while standard boats were building. The directors have decided to pay a dividend of only 1¼ percent, but, owing to various bonuses in the past, referred to above, this distribution represents a much greater percentage on the original capital of the company.

GOVERNMENT AID BY LOANS ASKED

With the continuance of depressing times it is only meet that captains of industry and others should look into the possible or probable remedies for shipping and other ailments. This line of action is now being taken in the United Kingdom. Mr. F. E. Powell, the chairman of the Anglo-American Oil Company, Ltd., and the President of the American Chamber of Commerce in London, is responsible for the suggestion that the Government should assist in arranging loans

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at a low rate of interest to shipowners on new ships built within the next three years, to be repaid over a period beginning two years after the vessels are in commission. Mr. Powell's plan is to scrap the existing obsolete tonnage, and, in its stead, build new, up-to-date vessels.

BREAKING UP BOUNTY ASKED

In addition, to induce shipowners and others to scrap old or obsolete vessels, Mr. Powell thinks that the Government should make a proposal that on all old ships sold to be broken up, and where the owner places orders for an equivalent new tonnage, with British builders, the Government should pay a bounty of, say thirty shillings per ton deadweight of the vessel broken up during 1923, and half that amount on boats broken up during the next two years. The value of old ships as scrap being about thirty shillings per ton deadweight, Mr. Powell reckons that owners would get about £3 per ton for the old vessel. He considers that the result of this would be that every shipyard in England would be full of work, and that, as "there is hardly a port in England where the facilities are what they ought to be," the docks of the country could also be assisted to improve and enlarge. To sum up, Mr. Powell maintains that the Government should arrange loans at not more than 3 percent interest for approved work begun in 1923 and 3½ percent for work commenced in 1924. "After that, the position is to be reconsidered as regards further new work," Mr. Powell concludes.

Having outlined, in necessary detail, Mr. Powell's scheme, let us see where his suggestion, if carried through to its logical conclusion, would be likely to lead us. On the surface, the construction of such a large amount of tonnage as would be involved would be a good thing for shipbuilders and their employees, but it is useless to disguise the fact that, if such a situation were created, the shipbuilding and engineering workers would inevitably demand higher wages such as would cripple the whole deal. But, apart from this aspect, it is feared in quarters competent to judge that, while the suggestion might prove a satisfactory temporary palliative, it would probably be of no more permanent benefit than the "doles" now being paid to the unemployed. It is felt that the scrapping of obsolete and inefficient tonnage will take place as a matter of course in the near future, inasmuch as the cost of laying up will force the hands of owners directly the freight market outlook makes it clear that remunerative employment for the boats is not, and will not be, forthcoming. As to the suggestion that the Government should arrange loans for shipowners at 3 percent per annum, it is thought that if shipowners availed themselves of such an opportunity it would be suicidal for them, and with them others, to spend money on producing boats for which no employment could be found.

REGULATION OF SERVICES

A suggestion from another quarter which has received attention here revolves round what are termed the "off" seasons—notably the middle months of the year. In those seasons many more passenger and cargo liners run than the trade which is offering warrants, there being, of course, no agreement in existence to restrain companies from continuing to employ their surplus vessels at heavy losses. It is suggested, therefore, that, during these "off" seasons, the companies might restrict their services, with due regard to the convenience of passengers, shippers and mails.

As matters stand, each shipowner or shipping company would seem to fear that any individual attempt to adjust the freight situation on the lines laid down would have the inevitable result of diverting traffic to competitors. It is realized that the scheme, to be successful, would have to be dealt with internationally, but it is maintained that it ought not to be beyond the capabilities of leading shipping men to devise an arrangement satisfactory to all of the parties.

Arguments for and against the motorship continue to exercise the minds of British shipowners, but, whatever doubts some may have as to the future for this type of craft, Messrs. Furness, Withy and Company seem pretty well satisfied with their experiences, so far as they have gone. They have for some time been carefully investigating the possibilities of the internal combustion engines, and, to use the words of their chairman, Sir Frederick Lewis, while there is no doubt a certain amount of development work still to be done before this type of marine engine is perfected, and the extra cost of production militates against any extensive program until these costs are reduced, still, as a result of their experience, Messrs. Furness, Withy have felt justified in contracting for two new vessels to be fitted with internal combustion engines.

BATTLE OF THE PORTS

The "Battle of the Ports," with London, Liverpool and Southampton as the eternal triangle, goes on. One has grown accustomed to learn, at various periods, that first one, and then another, of these ports is destined to become the "Supreme Port of the World." Liverpool and Southampton having taken their turn, and, incidentally, to some purpose, it is now considered as only right and proper that the searchlight of publicity should be centred on London. The Port of London Authority, who, as its name implies, is the controlling body, proposes new port works which are estimated to cost five millions sterling, the new facilities including dock improvements and the erection of a landing stage at Tilbury. It has been decided to construct a new dock, with a passage 80 feet wide, within the triangle now occupied by the Canada, Center and Quebec Ponds, which will afford five additional ship berths, each 400 feet in length. At Tilbury, which is actually 26 miles from London, but nevertheless a part of the London dock system, the authority has decided that the time has come for an entirely new dock to be constructed, of a size, both as regards the entrance lock and dry dock, and with a water area, adequate to meet the requirements of any ship built, building or likely be built for many years to come. The new entrance lock will be 1,150 feet in length, and will have a breadth of 130 feet. A dry dock of similar dimensions is also to be provided, but at the outset the length will, temporarily, be restricted to 800 feet.

Perhaps chief interest, however, attaches to the new landing stage at Tilbury. Lord Devonport, chairman of the Port of London Authority, has pointed out that some people hold the view that London is not, and never will be, a great passenger port. That is not Lord Devonport's view. He considers that, given adequate and comfortable facilities, the passenger traffic will expand, and he anticipates with confidence a great development. Tilbury Dock is estimated by the Authority's chief engineer to be finished in five years, and the bulk of the remainder of the program in about two and a half years. It only remains to add that the Government is putting up four and a half millions of the money, which is repayable, at interest of 3½ percent per annum, over a period of 30 years.

STANDARD OIL TUG BOAT LAUNCHED.—The *Socony No. 9*, the second of two steel single screw tug boats building at the Tebo plant of the Todd Shipyards Corporation for the Standard Transportation Company of New York, was launched on August 6. These tugs are to be equipped with vertical compound surface condensing engines with cylinders 18½ and 40 inches diameter by 26 inches stroke designed for a speed of 125 revolutions per minute. Steam will be furnished at a working pressure of 160 pounds per square inch by Scotch marine boilers with a heating surface of 2,700 square feet and equipped with Todd fuel oil burning equipment. The tug boats are 105 feet 9 inches long overall, 24 feet molded beam and 12 feet 9 inches molded depth.

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Two Recent Single Reduction Turbine Installations

Cruisers Gustav V and Drottning Victoria of Swedish Navy Obtain Excellent Trial and Performance Results

By J. D. Schmidt*

THE excellent results obtained on trials and the subsequent highly satisfactory performance in service, of the new cruisers *Gustav V* and *Drottning Victoria* of the Swedish Navy, have served to renew the interest which these vessels aroused when their construction was first proposed.

These two ships were contracted for before the war, but due to the unsettled conditions during, and immediately following hostilities, they were not completed until early in 1922. The final trials of the *Drottning Victoria* were run in June, 1921, and those of the *Gustav V* in January, 1922.

The hull of the *Gustav V* was constructed at Kockums Mek, Verkstads Aktiebolag in Malmo, Sweden, and that of the *Drottning Victoria* at the works of the Gotaverken in Gothenberg, Sweden. The turbines for both vessels were built by the Aktiebolag Lindholman-Motala at Motala, Sweden, in accordance with designs furnished by the Westinghouse Electric and Manufacturing Company, and under the supervision of their representative. The gears were designed and built by the Westinghouse Machine Company at East Pittsburgh, Pa.

*Marine engineering department, South Philadelphia Works, Westinghouse Electric & Manufacturing Company.

PRINCIPAL DIMENSIONS

Draft designed	20 feet 6 inches
Speed, maximum, knots	22.5
Shaft horsepower at maximum speed	22,000
Propellers, number	2

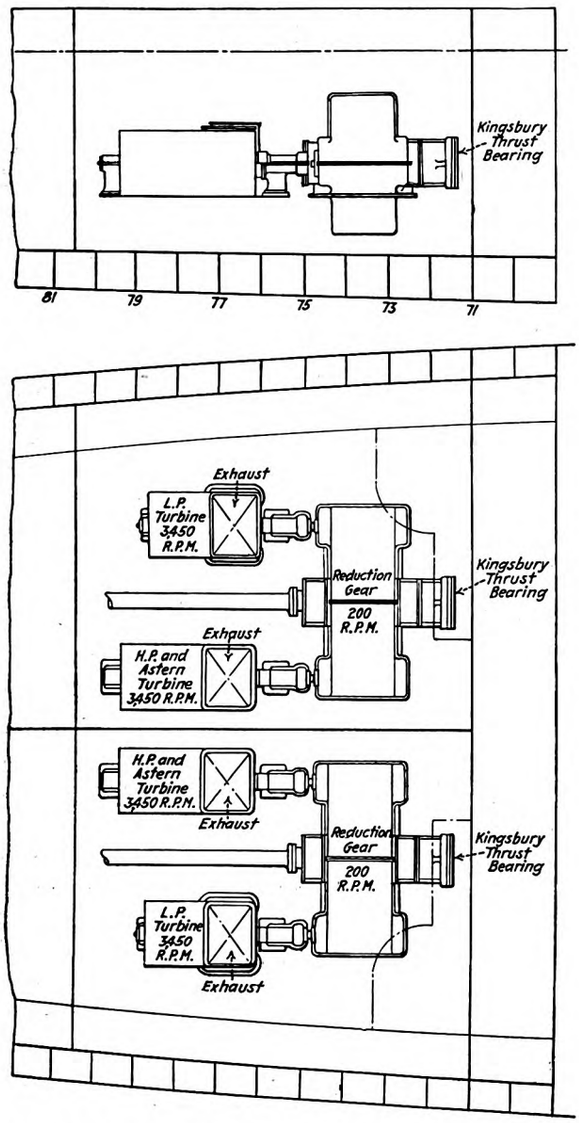

Fig. 1.—General Arrangement of Propelling Machinery

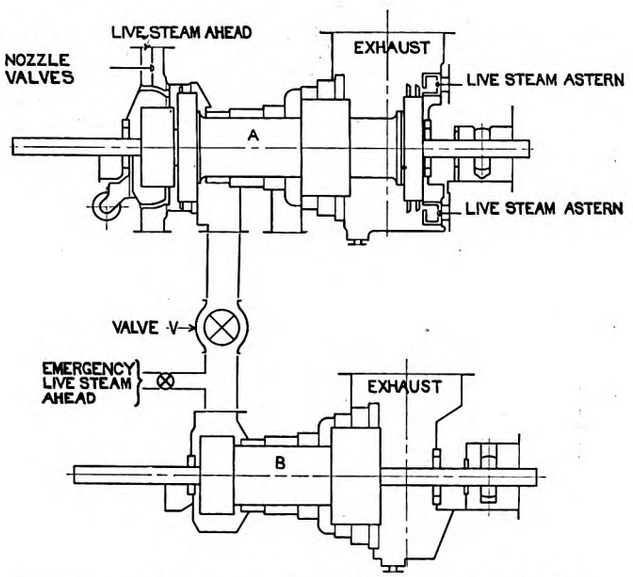

Fig. 2.—Showing Steam Path Through Turbines

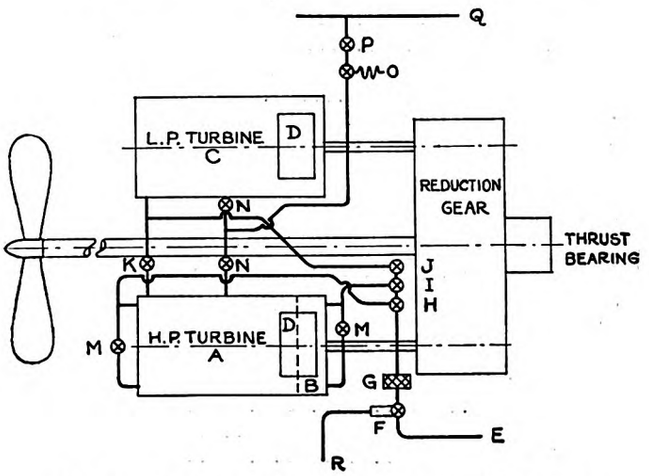

Fig. 3.—Diagrammatic Plan of Piping and Valves

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The armament in each case consists of four 11-inch guns mounted in turrets forward and aft, eight 6-inch guns in the secondary battery, six 12 pounders and two submerged torpedo tubes. The normal complement is 408 men.

The propulsive equipment is located in two engine rooms amidship, each of the twin screws being driven by two turbines of the divided-flow type. The speed reduction is accomplished by means of two-pinion single-reduction double-helical gears. Vacuum is maintained by means of rotary air pumps and condensate pumps. The operating conditions are:

Steam pressure at turbine..265 pounds per square inch gage
Quality.....Dry and saturated
Vacuum in exhaust.....28.27 inches referred to 30-inch barometer

The total weight given above is 63,065 pounds less than the total specified in the guarantee.

The general arrangement of the propelling units in the ship is illustrated in Fig. 1. Fig. 2 shows the steam path through the turbines, and Fig. 3 shows diagrammatically the piping, valves and maneuvering arrangements.

The divided-flow principle may be explained briefly as follows:

Turbines of low capacity are generally complete expansion units; i.e., the steam is expanded from inlet to exhaust pressure in a single cylinder. When the capacity exceeds certain limits, which vary with different manufacturers, the expansion must be split up, for structural and other reasons, and carried out in two or more cylinders. Where this is done

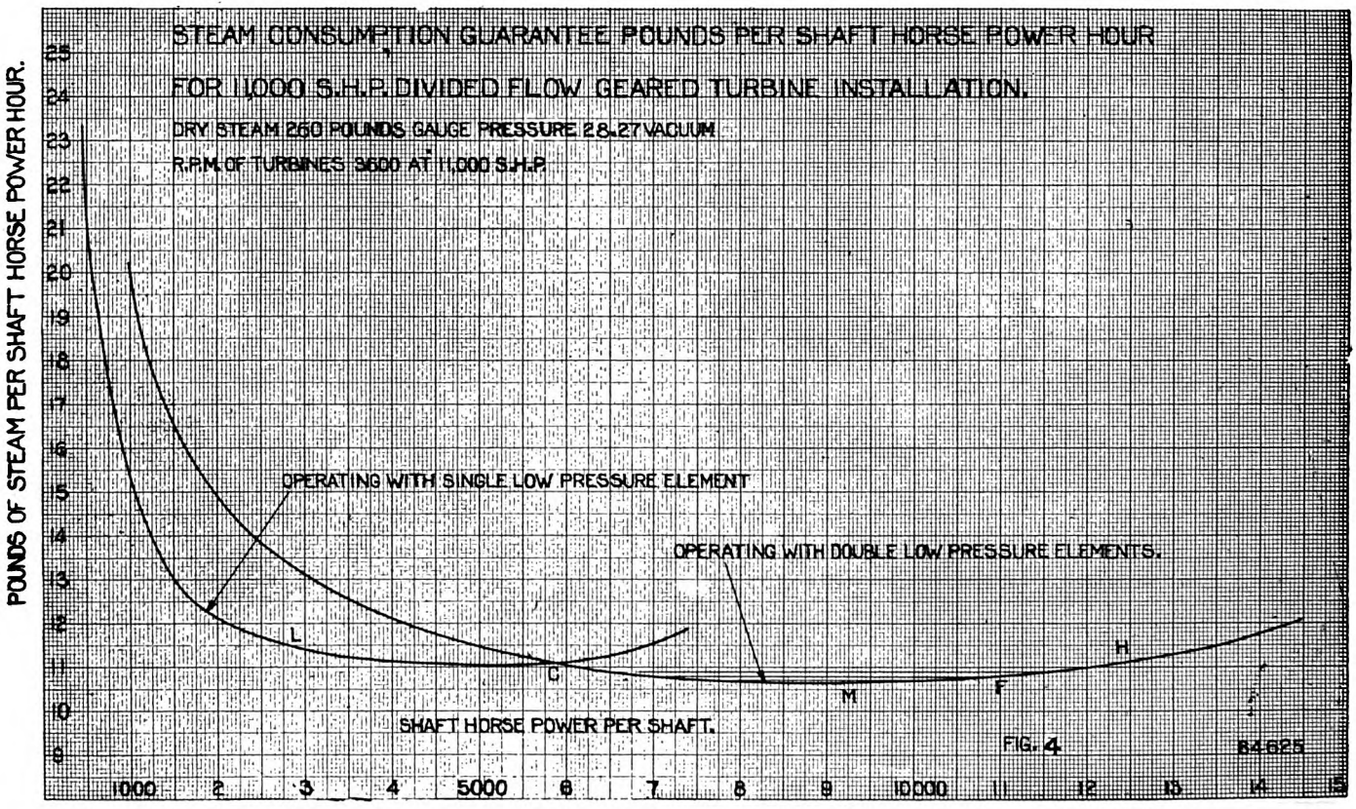
STEAM CONSUMPTION GUARANTEE POUNDS PER SHAFT HORSE POWER HOUR
FOR 11,000 S.H.P. DIVIDED FLOW GEARED TURBINE INSTALLATION.
DRY STEAM 260 POUNDS GAUGE PRESSURE 28.27 VACUUM
R.P.M. OF TURBINES 3600 AT 11,000 S.H.P.
POUNDS OF STEAM PER SHAFT HORSE POWER HOUR.
OPERATING WITH SINGLE LOW PRESSURE ELEMENT
OPERATING WITH DOUBLE LOW PRESSURE ELEMENTS.
L
C
M
F
H
SHAFT HORSE POWER PER SHAFT.
FIG. 4
84-625

Fig. 4.—Chart Showing Guaranteed Steam Consumption

The steam consumption guarantees were as tabulated below:

Speed in knots (approximate)..	22.5	20	12.5
R.P.M. propeller	200	177	115
R.P.M. turbines	3,600	3,186	2,070
S.H.P. (designed)	22,000	15,000	3,150
Water, lbs. per SHP/HR.....	10.9	11.1	13.3

The designed maximum ship speed was 22.5 knots at 7,000 tons displacement for which it was estimated that 22,000 shaft horsepower would be required. On trial the *Drottning Victoria* maintained the contract speed of 22.5 knots at 6,950 tons displacement with 19,750 shaft horsepower. On the high speed trials of the *Drottning Victoria*, both the speed and the fuel consumption guarantees were bettered by considerable margins and the trial performance of the *Gustav V* was equally satisfactory.

The machinery weights per ship, as actually built, are as follows:

4 turbines	101,948 pounds
2 reduction gears.....	169,034 pounds
Piping valves, etc.....	19,942 pounds
Total pounds	290,924
Total tons (2,240 lb.).....	129.9

the two or more turbines comprising the unit may be used in series or in parallel. If they are used in series, all the steam passes first through the high pressure turbine, and the exhaust is led to the inlet of the low pressure turbine, which exhausts to the condenser.

These turbines, however, are in parallel. All the steam passes first to one turbine, (A, Fig. 2) nominally designated as the high pressure. After all the steam has passed through the first or impulse stage of this unit it is divided and while about 40 percent of the total continues on through the reaction stages of turbine A the other 60 percent is carried over through a cross-over pipe to the so-called low pressure turbine (B, Fig. 2) where it is expanded through reaction stages down to exhaust. Thus both turbines exhaust to the condenser and develop equal power, but one exhaust end handles 40 percent and the other 60 percent of the total steam. This is what is known as the divided-flow type.

Particularly Suited to Naval Vessels

This type of turbine is particularly suited to the purposes of a naval vessel inasmuch as a high efficiency can be maintained over a considerable range of speed without resorting to the additional complication of a cruising turbine.

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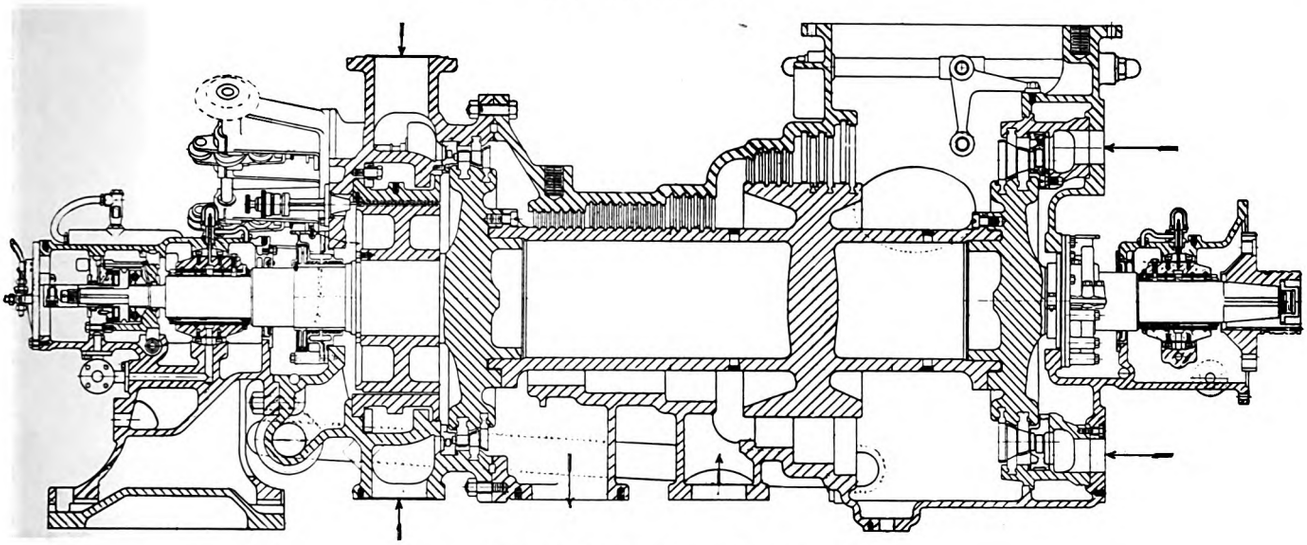

Fig. 5.—Section Through High Pressure Turbine

The results obtainable with this type machine are shown in the water rate curves given in Fig. 4. The method of procedure in operating at various powers is as follows:

When steaming at full speed the steam path is as described in the preceding paragraph. At reduced speeds, however, the cut-out valve between the high pressure and low pressure turbines is closed, see Fig. 2, causing the steam to flow through the reaction blading of the high pressure turbine only, the low pressure turbine meanwhile revolving idly in high vacuum, or being disconnected if the reduced power is to be maintained for a considerable period.

This arrangement improves the economy at cruising speed since a small turbine is used at full or nearly full power, instead of using both turbines at reduced power. The reduction in area for the flow of steam consequent upon cutting out the low pressure turbine improves the pressure distribution and increases the efficiency of the turbine. The blading of the high pressure element is also especially designed for efficient operation at cruising speed, extra rows of blades being provided. Since the low pressure turbine is used only at approximately full speed, its blading is arranged for this condition only, less rows being required than would ordinarily be the case. This design also permits a high speed of rotation, thereby reducing the weights considerably. In case of emergency either turbine may be used independently of the other, making complete break-down a remote contingency. Furthermore, since the turbines have a great overload capacity it would be possible, in case of emergency, to develop three-fourths or more of full load power with one turbine only.

One of each pair of turbines is equipped with an astern turbine in the same casing, which is capable of delivering 41 percent of the ahead power with the same steam flow, or 9,000 shaft horsepower at full power.

Description of Turbines

The ahead high pressure turbine consists of a two-row impulse wheel followed by reaction blading on a drum as shown in Fig. 5. The ahead low pressure turbine, which is illustrated in Fig. 6, contains reaction blading only. The astern turbine is located in the exhaust chamber of the high pressure ahead turbine and consists of a single two-row impulse wheel.

The cylinder of the low pressure turbine is made entirely of cast iron. The cylinder of the high pressure turbine is made in two sections, the low pressure end being of cast iron and the high pressure end, which contains the nozzle chambers, being made of cast steel.

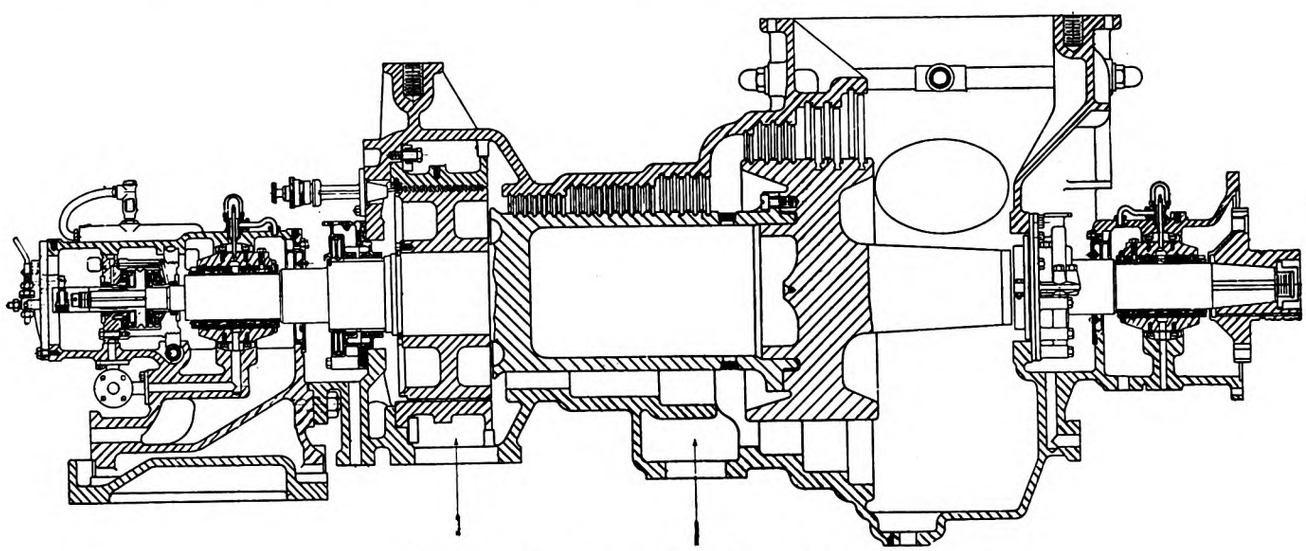

Fig. 6.—Section Through Low Pressure Turbine

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The rotors of both turbines are made of forged steel. In the high pressure turbine the impulse wheel is carried on a solid disk formed integral with the spindle end. (See Fig. 5.) The high pressure stages of the reaction blading in both turbines are carried on drums; the low pressure stages of the reaction blading in each case are carried on a solid disk, which in the high pressure unit is integral with the drum, but in the low pressure turbine is part of the spindle end. This construction is clearly shown in the assemblies, Figs. 5 and 6.

The impulse blades are machined of nickel steel and are secured in the rotor by a substantial tongue and groove construction. The reaction blades are made of drawn phosphor-bronze and are secured in dove-tail grooves by a positive mechanical interlock between blades, packing pieces and grooves. This construction is shown in Fig. 7. The ahead turbine nozzle chamber, shown in Fig. 5, is divided into compartments, each of which is provided with a group valve, hand operated from the maneuvering platform, for closing off part of the nozzles at reduced power. The steam thrust is partly balanced by means of balance-pistons of the labyrinth

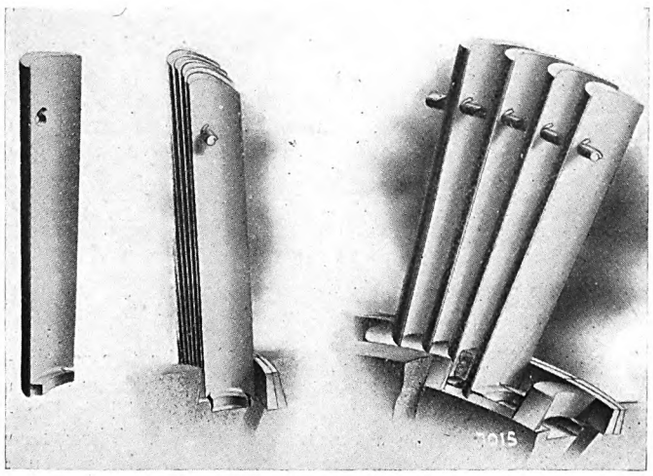

Fig. 7.—Details of Reaction Blading

type located at the inlet ends of the high and low pressure turbines.

Steam and Water Seal Glands

The glands are a combination of the steam seal and water seal types, as shown in Fig. 8. The steam gland is sealed from an annular chamber in the usual manner. The water seal operates on the principle of a centrifugal pump, the impeller being provided with radial paddles or ribs which revolve in a chamber supplied with water at the periphery of the impeller. The centrifugal action of the paddles on the water in this chamber causes it to revolve and to form an annulus of water around the outer circumference of the impeller, thus forming a perfect seal against leakage of air.

The water seal is designed to be effective from full speed down to half speed. Below half speed the centrifugal force imparted by the impeller is not sufficient to maintain the seal and therefore, when cruising or maneuvering below half speed, or when standing by, it is necessary to use the steam gland. Steam is supplied to the labyrinth glands at a pressure of about 5 pounds per square inch gage. Water is supplied to the water glands at a pressure corresponding to a head of about 10 feet, the supply being taken from the feed water system through a suitably placed overhead tank.

The main bearings are of the self-alining type and are provided with pads and liners for adjusting the position of the rotor.

The thrust bearing is of the Kingsbury segmental type

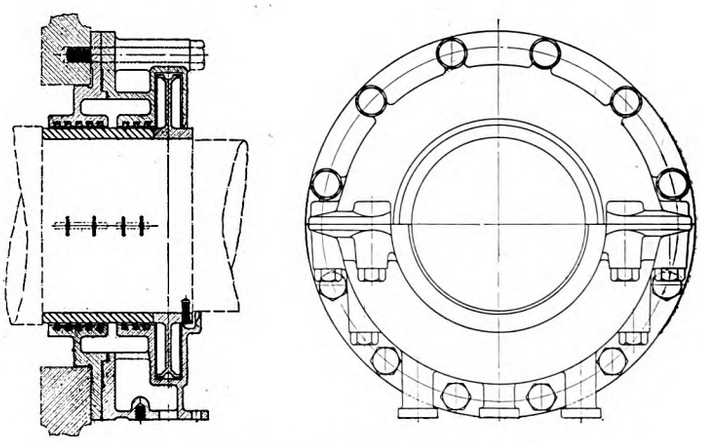

Fig. 8.—Steam and Water Seal Gland

and is provided with a screw adjustment for moving the rotor endwise for setting the dummy clearances.

The turbine shaft is connected to the flexible pinion driving shaft by means of a flexible pin coupling, which permits the pinion to move endwise. Provision is made for lubricating the coupling pins and bushings.

The Emergency Governor

Each turbine is fitted with a Westinghouse type emergency overspeed stop governor located at the thrust end of the machine, beyond the thrust bearing. This device consists of an eccentric weight held by means of a suitable spring and retainer in a hole drilled transversely in the shaft. In the event of overspeeding of the turbine from any cause, when the rotor reaches a predetermined number of revolutions per minute fixed by the relation of the spring scale and eccentricity of the weight, the centrifugal force on the weight becomes great enough to overcome the resistance of the spring and the weight moves radially outward. The relation of the parts is such that when the weight begins to move its centrifugal force increases more rapidly than the compression of the spring so that it at once moves out to the limit of its travel. In so doing it strikes a trip lever, located in the plane of its motion, the hardened end of which rests normally about 1/16 of an inch away from the circumference of the turbine shaft.

The displacement of this trip lever opens a valve which admits steam to the operating cylinders of the throttle valve and the auxiliary exhaust inlet control valve causing them to close.

The emergency stop governor may be reset by means of a

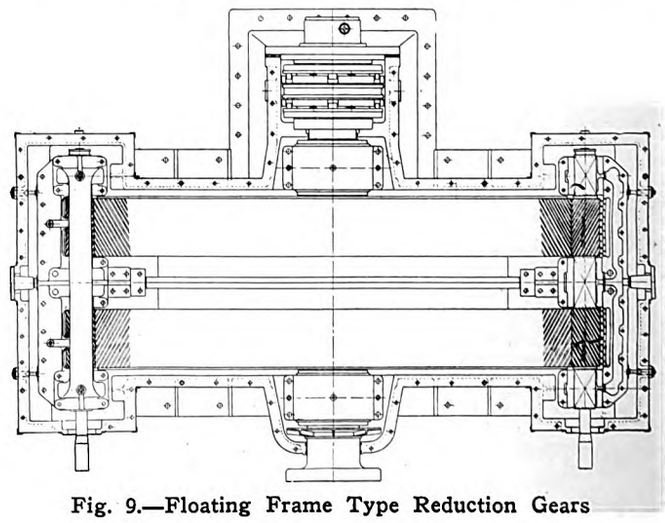

Fig. 9.—Floating Frame Type Reduction Gears

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hand lever on the end of the bearing pedestal and as soon as it is reset balance is restored and the valves re-open automatically.

Just ahead of the governor valve in the main steam line is a steam strainer consisting of a cylindrical perforated steel strainer fitted in a cast iron body.

The admission of steam to the ahead and astern turbines is controlled by two single piston valves having circumferential ports and a pilot valve by means of which the pressure above and under the valve is equalized in the act of opening. These valves are placed on a stand at the after end of the gear case and alongside the main valves is placed the throttle valve for admitting emergency steam to the low pressure turbine. With this valve arrangement it is possible to operate either ahead turbine independently of the other in case of emergency. Nozzle control valves are furnished to permit the nozzle area to be adjusted to suit the operating conditions in order to maintain the best possible efficiency at all times. These valves are likewise located so that they may be opened or closed without leaving the maneuvering platform.

Reduction Gears

The reduction gears are of the Westinghouse floating frame type as shown in Fig. 9. A Kingsbury segmental thrust bearing is located at the forward end of the gear, to take the propeller thrust. At the designed full speed the gears reduce the revolutions from 3,540 to 200, the reduction ratio being 17.23 to 1. Each pinion transmits 5,500 horsepower, the total for one gear being 11,000 horsepower.

The gears are completely enclosed in an oil-tight cast-iron box divided on a horizontal plane. The gears are of the double helical type, the teeth being inclined at an angle of 30 degrees. The teeth are of involute form and are cut with the utmost precision to obtain quiet and reliable operation.

The pinion is of the three-bearing type, as shown in Fig. 9, and is carried in a heavy floating frame supported on I beams, which automatically maintain the alinement of the pinion and gear under all conditions of load, thereby producing uniform distribution of pressure over the entire length of tooth face. The pinion is driven by a flexible shaft, see Fig. 9, which extends through it and is secured to the end distant from the coupling. The flexible coupling permits the pinion to move endwise, and the flexible shaft permits the floating frame to function without restraint. The resulting uniform distribution of tooth pressure permits the use of higher pressures and smaller pinions and gears than is the practice where rigid bearings are used.

The pinions, Fig. 13, are single forgings of carbon steel. The gear wheels are composed of a heavy forged-steel shaft, cast-iron center and cast-steel rims. The gear and pinion bearings have heavy cast-iron bodies lined with white metal, and are supplied with oil from the main oiling system, the pressure at the inlet to the gear case being about five pounds per square inch. A copious supply of oil is sprayed on the pinion so as to pass between the meshing teeth and afford the required lubrication and cooling.

Kingsbury Thrust Bearing

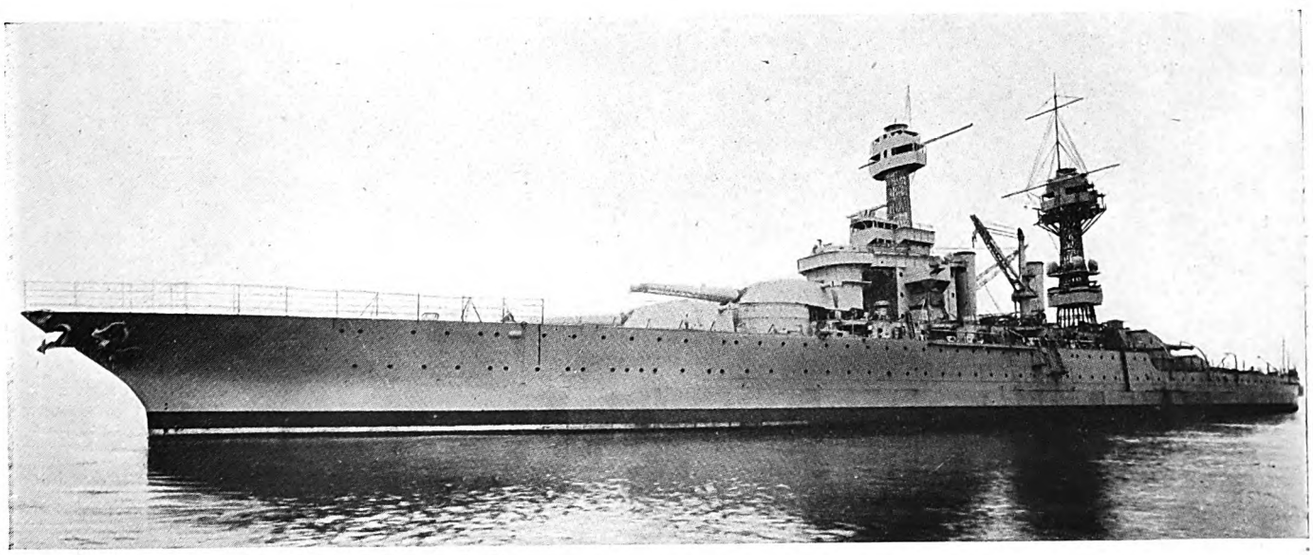
The Kingsbury thrust bearing, which takes the thrust of the propeller, is located at the forward end of the gear, and is composed of a single collar, which operates between segmental shoes made of forged steel and lined with babbitt. Each shoe is pivoted on a hardened seat, which permits it automatically to assume the position required to distribute the load uniformly over the entire surface. This uniform distribution of pressure due to the self-alinement of the shoes, gives perfect film lubrication, which permits the use of a considerably higher unit pressure than is used in ordinary thrust bearings, and also gives greater reliability of operation.

The principal parts of the bearing are made of forged and cast steel. The bearing is lubricated by a continuous circulation of oil, which is admitted near the bottom and completely fills the casing, the outlet pipe being led from the top of the casing and returning the oil to the drain system.

Lubricating System

The lubrication of the main turbine bearings and the gear teeth and bearings is effected by a continuous circulation of oil through a pressure system composed of delivery and return piping, pumps, cooler, strainer and tank. Oil is supplied to the bearings and teeth under a pressure of about five pounds per square inch.

The turbines were constructed in Sweden as before mentioned and it speaks well both for the thoroughness of the design and the character of the craftsmanship of the Aktiebolag Lindholman-Motala, that the machinery was delivered without a hitch and has since established an enviable reputation for continuity of service and simplicity of operation.



The U. S. S. Colorado, the World's Mightiest Super-Dreadnaught

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New British Marine Oil Engines Developed

Beardmore Builds Largest Semi-Diesel Ever Installed in Cargo Vessel—Richardsons, Westgarth Construct Modified Tosi Engine

By Our Special London Correspondent

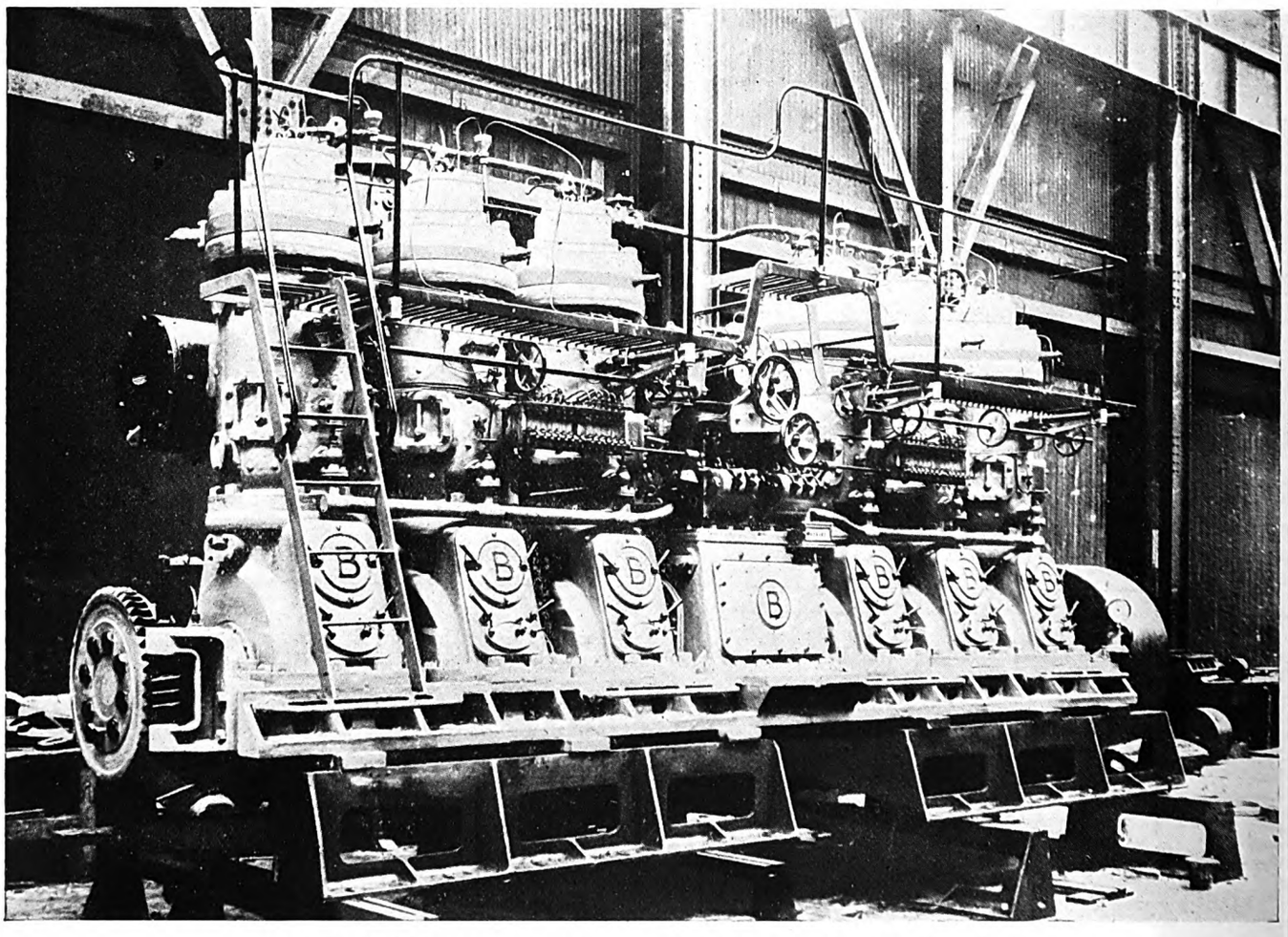
UP to the present time, British shipowners have paid comparatively little attention to the possibilities of what in England is generally called the semi-Diesel or hot-bulb motor, for the propulsion of cargo ships. Considerable surprise was therefore evinced when it became known that Beardmores, the well-known Clyde shipbuilding firm, had produced two engines of this class, the largest ever constructed, for installation in a cargo ship of about 4,000 tons deadweight.

There are numerous vessels of this size, some of them quite recently built, and equipped with machinery of equal power, in which a Diesel plant is utilized, and it would thus appear that competition would now arise between semi-Diesel and Diesel engine builders in connection with ships of moderate tonnage. It is a curious fact that Beardmores are also manufacturers of ordinary Diesel motors, but the two types are constructed in separate works.

The ship referred to, which is now fitting out at Bristol, is 310 feet in length with a beam of 43 feet 6 inches, and the two new engines which are to be installed are designed to develop 750 brake horsepower, although the normal working output will be 600 brake horsepower. The largest semi-Diesel motor that has hitherto been produced is of 500 brake horsepower and several of this type have been constructed by Bolinders, by the Kromhout firm, and by Vickers Petters.

A Saving in Weight

There is a considerable saving in weight in the new Beardmore motor in comparison with the Diesel engine, since this amounts to only 45 tons, whereas with the latter design, the weight would probably be in the neighborhood of 80 tons. Presumably there is a corresponding reduction in capital cost, which is an important point since the average motorship costs between 15 and 30 percent more than a corresponding steamer. The bore and stroke are 18 inches and 24 inches respectively with a speed of 185 revolutions per minute for full power. As will be gathered from the illustration, the engine is of normal semi-Diesel type, so far as crank chamber compression is concerned, and this involves the construction of separate cylinder units, each with its own self-contained crank chamber, in which the scavenging air is compressed to about 3 pounds per square inch on the downward stroke, before being admitted to the cylinder through ports in the bottom. The



A 750-Brake Horsepower Semi-Diesel. The Largest of its Type Yet Built

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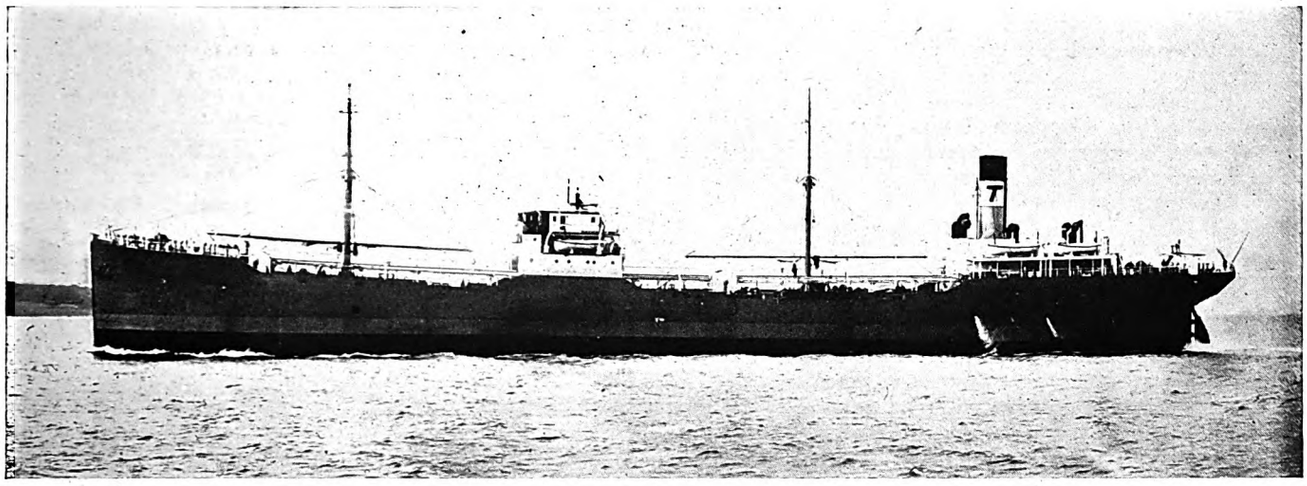


The 10,000-Ton Motor Tanker Scottish Borderer

cylinders are cast separately, being flanged at the bottom for bolting on to the crank chamber, and at the top for the attachment by means of bolts of the water cooled cylinder cover.

Electric Hot Plug

The "hot bulb," if it can so be called, is of special design, owing to the fact that the heating effect preliminary to starting, which is always necessary in semi-Diesel motors, is provided by an electric plug arranged in the top of the bulb and not by a blow lamp, which is the ordinary system. This plug, which projects into the combustion space is wound with a resistance wire, and when a current is passed through it, becomes sufficiently hot in about 20 seconds to allow the engine to start up. Thus the new motor suffers under little, if any, disadvantage in comparison with a Diesel engine in this respect.

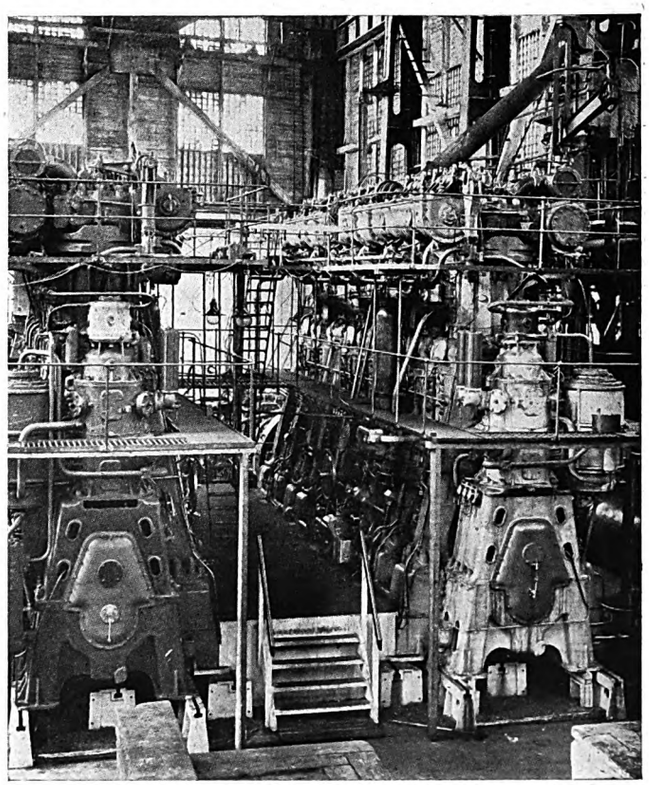
Starting is accomplished by admitting compressed air to the cylinders through automatic non-return valves in the cylinder head, the necessary distribution being effected through mechanically operated distribution valves, arranged between the two sets of three cylinders. The six fuel valves are also located at this point and deliver through automatic valves, and it is to be noted that the timing of injection is the same for ahead or astern running, so that in reversing no alteration has to be effected. This process is therefore carried out by turning the starting wheel, which only controls the admission of compressed air. The engine represents a noteworthy departure and as the manufacturers are said to be contemplating building still larger sizes, the performance of the first vessel equipped with these engines may have some influence upon motorship construction—at any rate in the smaller types.

The Richardson Tosi Engine

In the year 1922, the largest output of reciprocating steam engines in the United Kingdom, was achieved by Richardsons, Westgarth and Company of Hartlepool and Middlesborough. The first marine Diesel engine built by this firm, therefore, possesses more than ordinary interest, especially as it has adopted a very conservative policy before developing along these lines. The twin screw installation has just been completed for a 6,000-ton Furness Withy motorship, and although the design is based upon that of the engines built by the well-known Italian firm, Tosi of Legnano, Richardsons, Westgarth and Company have introduced a number of modifications. This has in fact been the case in practically all the Continental Diesel engines which have been taken up by British builders under license.

Combined Valve for Equalization of Temperature

The new Richardson-Tosi motor is of the four-cycle type with six cylinders, 24.41 inches bore and 38.39 inches stroke, the output at 120 revolutions per minute being 1,250 brake horsepower or 1,550 indicated horsepower with the rather high mechanical efficiency of 80 percent. In one feature, this engine differs from all other designs. The same valve is used for the admission of the air on the suction stroke, and the discharge of the exhaust gases; the control for the two purposes is effected by a semi-rotary valve which puts the combined valve first in communication with atmospheric air and secondly with the exhaust pipe. There are two of these combined valves in each cylinder cover so that there is more valve gear than with a normal design. It is claimed, however, that the equalization of temperature thus produced,



A Twin Screw Richardson-Tosi Installation for a 6,000-Ton Motorship

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and the cooling of the valves by the incoming air, are advantages that warrant the extra expenditure, and the result is that the valve may operate for very long periods without having to be reground.

Another novelty is the system of reversing. Its chief object is to avoid having to move the heavy camshaft fore and aft as is commonly done. The reversing mechanism, therefore, merely lifts the valve levers off the cams, and then causes the rollers of the levers to move the necessary distance to bring them over the astern cams. Forked pieces are provided at the end of the valve levers, with a horizontal spindle, along which the rollers may move. Instead of operating the reversing mechanism by an air servo motor, a small electric motor is used for the purpose. One advantage of this arrangement is that there is a saving in compressed air. All the valves are arranged in cages and the valve levers are jointed in such a way that by uncoupling these joints, the valves can be removed from the cylinder head without dismantling any further gear.

Popularity of Motor Tankers

Tank ships are, of course, very suitable for propulsion by internal combustion motors, and it is notable that a large proportion of the orders that have recently been placed for vessels carrying oil in bulk are to be propelled by Diesel engines. Among the latest contracts, are a 10,000-ton ship to be built by Armstrong Whitworths for a Belgian concern, and equipped with Sulzer type machinery of 2,700 brake horsepower, a 5,000-ton motor tanker with a Nobel Diesel two-cycle engine, of 2,000 brake horsepower, a 12,800-ton vessel for a Norwegian concern, to be equipped with 4,000 horsepower Werkspoor machinery, and a 6,500 tonner for Dutch owners, in which an 1,800 brake horsepower Harland & Wolff engine is fitted.

There has just been completed at Denny's yard on the Clyde, an interesting tanker, as she is the first vessel of this class to be fitted with British built Sulzer machinery. The *Scottish Borderer,* as she is named, is the fifth motor tanker constructed for the British Tanker Company, Ltd., and she carries 10,000 tons of liquid fuel. Two engines, of 1,250 brake horsepower each, with four cylinders are fitted, and, unlike most of these motors, drive their own scavenging pumps, the independent turbo-system not being adopted. A speed of 11 knots is attained on a fuel consumption of about 9 tons daily. The auxiliary machinery, contrary to usual practice, is steam driven.

Chemicals Endanger Carriage of Iron Goods

Smoke Helmets Sometimes Required to Enter Holds—Delayed Insurance Claims Causing Difficulties — Norwegians Fear Compulsory Insurance

By "Bordereaux"

IRON goods in transit often suffer serious damage through chemical influences. There has been considerable complaint, of late, of injury to consignments of such merchandise at Buenos Aires, the cargoes including iron wire, sheet iron, steel tubing, etc. It was at first supposed that sea water was the cause of the damage, but more complete examination made it appear most improbable that a ship could have stood up under such inroads of water as would have been necessary to have done the damage in evidence. Observation of steamers arriving at the South American port has led to the belief that the action of chemicals is properly chargeable with the results. It is now insisted that special care must be taken in stowage. Such corrosive chemicals as chloride of lime and acetic acid ought never be taken into the same holds with iron goods.

Captains and shipping agents too frequently try to conceal this sort of thing, but that only delays the employment of necessary remedies. It is stated that there are instances where stevedores, unloading cargo, have had their hands and clothing burnt because chloride of lime had fallen out of broken casks on the rest of the cargo in the hold; and, cases are cited where the holds could only be entered by men wearing smoke-helmets, because the vapors from broken jars of chemicals abounded and had seriously rusted all the iron goods in the holds. There is considerable business in the insurance of particular average, but unless the losses are infrequent there is no profit in it to the insurers. Checking of the stowage seems to be more important than surveys before loading.

Delayed Claims

THE late presentation of claims is one of the peculiarities of marine insurance and an element that contributes not a little to its difficulty. In the case of vessels, the repair of damages that do not disable the ship may be delayed for a long time if freights are good and the owners do not wish to lay the vessel up. Owners may delay the collection of claims even when the repairs are made. Collision cases frequently involve prolonged liquidation extending over several years. Cargo damages often bring hundreds of consignees into the problem, with almost endless communications with parties scattered all over the world. During the war, these complications were enormously aggravated and the improvement to date has not been great. The framing of marine accounts, in consequence, becomes a matter of the utmost difficulty.

British Hull Values and Rates

IN England hull values and rates continue to be reduced under spur of violent competition. It is the old trouble —too much marine insurance facility and too little business. It is said that values as low as £2 have been fixed for recent cover. At no previous stage in its history has the British market quoted rates as low as it is now doing, especially as concerns the smaller type of vessel. Certainly, there is no justification in the claims experience for such action. A very large number of steamers have been renewed at values and rates below those that prevailed in 1914. It is hard to understand why underwriters will persist in so doing, especially when it is borne in mind that repair bills are still about fifty percent over pre-war cost; and the steamers are nine years older.

War Risk Award Reversed

THE war risk insurance award of $280,105 granted the Standard Oil Company of New Jersey by the Federal District Court of that State has been set aside by the United States Circuit Court of Appeals at Philadelphia. The lower tribunal had held that the loss of the vessel, which was the tanker *Llama,* came within the terms of the policy. The *Llama* went down in Westray Firth, off the English coast, in October, 1915. She was en route to Copenhagen

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and struck a submerged rock, stranding and subsequently sinking. The United States carried her war risk but payment was refused on the ground that her loss was not due to a war peril. Now the Court of Appeals rules that the vessel's loss resulted from a marine peril and to errors of navigation; not from a war hazard.

Cargo Rates for Munson Line

RECOMMENDATION has been made by the Underwriting Conference Committee that for rating purposes the Shipping Board owned steamers operated by the Munson Line out of United States Gulf ports to the East Coast of South America be granted the same basis of classification as the cargo boats operated by the Lamport & Holt Line in the same trade.

Hull Insurance in Norway

UNDERWRITING and shipping interests in Norway are greatly relieved that the new Norwegian cabinet, which came into office a few weeks ago, is to proceed no further with the compulsory insurance scheme fostered by a previous Government. The enforcement of this proposal was postponed one year ago, under stress of the unanimous opposition of owners and underwriters, to enable owners to effect a consolidation of the mutual insurance clubs. Since that time the number of these clubs has been considerably reduced and a consolidation and reorganization of those that remained has been effected. A claims office for the compilation of statistical data has been established and the insurance companies have joined it, and there has been a general revision of the insurance conditions of the mutual associations. In view of these improvements a general alarm went the rounds when it was intimated that the Government was to resume discussion of the compulsory scheme in parliament. Happily, the Government has "seen a great light" and will drop the matter and let good enough alone.

Liability of Carrier

COURT definition of the legal responsibility of a carrier was given in an opinion recently handed down by the United States Circuit Court of Appeals, Ninth Circuit, in a libel in admiralty by the Willamette Navigation Company vs. the Hartford Fire Insurance Company, 287 Fed. Rep., 464. The navigation company undertook the transport of certain rolls of paper, by the steamship *Ruth,* under a bill of lading subject to the condition that the carrier should not be responsible for loss or damage resulting from "the perils of the lakes, seas, or other waters, or from collision, stranding or other accidents of navigation." The navigation company took out insurance with the Hartford Fire by open policy "for account of themselves, loss, if any, payable to assured."

The *Ruth* stranded and sank, and a quantity of the paper was damaged. The navigation company filed a libel against the insurance company to recover, under the policy, the amount in part of the loss and damage to the paper.

The Circuit Court of Appeals held that the navigation company, being a bailee for hire, whether as carrier or warehouseman, could lawfully insure the entire interest in the paper entrusted to its care for carriage or storage, and, if loss occurred, would be entitled to demand and collect from the insurer the entire amount of the loss sustained covered by insurance. However, in such case it would hold the excess above its own interest in the paper for the use and benefit of the owners of the paper, or others concerned therein.

In support of this holding citation was made of the case of the Munich Assurance Company vs. Dodwell & Co., 128 Fed., Rep., 410, in which it was said:

"We think that the true doctrine is that the carrier has an insurable interest in goods in his possession as such, to the full extent of their value, against a loss for which it is possible that he may become responsible, and that the question whether he has the right to recover under the policy is not to be determined after the loss by inquiring whether in fact he is then liable to the owners of the property for the value thereof or for damage thereto. . . . It had the right to insure against its own negligence, as well as against the necessity of being required to enter into the inquiry whether its own negligence caused or contributed to the stranding of the vessel."

Turning to the policy, the court expressed the view that the insurance being "for account of themselves," comprised a particular person; that is, the assured, to whom the loss is payable. Cooley's Briefs on Insurance was quoted: "The general rule is that a policy made in the name of a particular person will not protect the interest of any other person, unless the words 'for whom it may concern,' or their equivalent, indicate that it is intended that the interest of some other person be covered."

It was also shown by the authorities that a policy in the name of one joint owner of a vessel "as property may appear," without a clause stating the insurance to be for the benefit of all concerned, does not cover the interest of any other joint owner. It was further held that where the insurance policy issued to the carrier covered only the carrier's interest in the cargo, there could be no recovery thereon for the shipper's interest in the cargo, where the loss resulted from stranding of the ship, for which the carrier, under the bill of lading, was not liable to the cargo owner.

Excursion Steamers for Wilson Line

(*Continued from page* 535)

piston type fire and donkey pump suitable for a working pressure of 210 pounds. The pump cylinders are of cast iron heavily brass lined and brass fitted and are of the separate cylinder type. The steam valve gear is of the outside adjustable tappet type with link connection to cross heads, permitting of adjusting the stroke of pump while in motion.

There is one 4¼-inch by 4¾-inch by 5-inch vertical duplex piston pattern fresh water pump with cast iron pump cylinders, brass lined and brass fitted for fresh water supply to all lavatories, sinks and ice and hot water systems through a pressure tank on the boat deck.

There is one 6-inch by 6-inch by 8-inch vertical duplex piston pattern sanitary pump having a cast iron pump cylinder, brass lined and brass fitted. The steam valve gear of this pump is also of the outside adjustable tappet type with link connection to the crosshead.

There are two 6-inch by 3½-inch by 6-inch horizontal duplex piston pattern special fuel oil service pumps, designed for 300 pounds oil pressure. The pump cylinders are of cast iron and are especially designed for fuel oil service.

For circulating brine on the refrigerating system there are two 4½-inch by 3¾-inch by 4-inch vertical duplex piston pattern pumps having cast iron pump cylinders, brass lined and brass fitted.

For ice water circulating, there are three 4½-inch by 2¾-inch by 4-inch vertical duplex piston pattern pumps with cast iron pump cylinders, brass lined and brass fitted.

The steam cylinders of all of the foregoing pumps are covered with 85 percent magnesia and lagged with planished iron, making a very neat finish.

A hot water circulating pump and heater are fitted for the hot water supply to the sinks, lavatories and showers throughout.

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Protective Coverings for Shipbuilding Purposes: Paints—Bottom Compositions

By Horace Holden Thayer*

Continuation of a series of articles containing information regarding shipbuilding materials and their uses that is not readily obtainable from shipbuilding handbooks and other generally available sources. The articles are not intended to be a complete exposition of the subject but will be found to contain items of value to the various classes of workers in this field who have to deal with these materials from the materials point of view.

BOTTOM compositions on steel ships have to fill two functions,—that of preventing corrosion and that of preventing fouling. This has led to the general practice of having the bottoms painted with two kinds of paint over the priming coat, the inner coating being called anticorrosive paint and the outer, antifouling paint. Corrosion is not a factor on wood ships but the antifouling paint on them has also to serve the purpose of preventing the attack of the teredo and other marine wood borers which honeycomb the wood. Corrosion is also not a factor on concrete ships; and as factors peculiar to concrete ship construction enter into the subject of bottom compositions for these vessels, this matter has been dealt with in the writer's article on "Cement and Concrete for Shipbuilding Purposes" in the June and July 1922 issues of this magazine. Furthermore some bottom compositions that adhere well to steel ships have not been found to adhere well to concrete.

The antifouling properties of the general run of antifouling compositions result from the use of a poisoning ingredient which is usually mercuric oxide in paints for steel ships and copper oxide in paints for wood ships. The latter composition is often called copper paint. Some copper paints also contain mercuric oxide. A very interesting series of tests of the toxic value of these chemicals, together with copper cyanide, copper acetate, copper chloride and mercuric chloride, have been made by Mr. A. W. L. Bray of Washington University, St. Louis, Mo.; and these tests indicate that copper cyanide would be very efficient in an antifouling paint. The copper acetate, copper chloride and mercuric chloride are probably so soluble in sea water as to afford a very brief protection. The solubilities are about as follows:

	Grams per 100 Grams of Solution.
Copper Oxide	Trace
Copper Cyanide	Trace
Mercuric Oxide	.05
Mercuric Chloride	12
Copper Acetate	13
Copper Chloride	47

The American Society for Testing Materials started out in 1921 to test the anticorrosive and antifouling properties of a great many compositions, which they applied to steel panels immersed in Raritan Bay, N. J., and also at Charleston, S. C. On a part of the panels anticorrosive paint only was applied. The poisons used in the antifouling paints were yellow mercuric oxide, mercuric arsenate, mercuric phenate, mercuric oleate, cupric oxide, cuprous cyanide, zinc cyanide and zinc stearate. These were added to a mixture of Spanish oxide, zinc oxide and asbestine to make a total pigment content of 40 percent, the vehicle being 60 percent in every case. Results reported at the annual meeting in June 1922 indicated the advisability of limiting further tests of antifouling paints to those containing copper and mercury compounds, and such further tests were decided upon. Copper compounds alone or in mixtures with other poisons showed excellent antifouling properties in the Raritan Bay tests, but were not as satisfactory as the mercury compounds when immersed at Charleston, S. C.

There is also a type of antifouling composition which is of a saponifying nature, and a gradual sluffing off of the paint prevents the adhesion of marine growths.

Antifouling Paints Must Be Frequently Renewed

The antifouling paints at the best do not retain their protective properties many months and hence vessel bottoms have to be repainted at regular intervals. There are, therefore large amounts of bottom compositions used, and as a result there are a number of proprietary bottom compositions on the market; and they are in many cases applied by their manufacturers, whether the vessel is at a shipyard or in drydock. As with all other materials, the extended results of actual service are of more value than theoretically excellent formulæ, laboratory tests, etc.; and having the former to fall back upon, the designer, owner or operator will usually approve the use of some proprietary composition with which he has had favorable experience and gives himself no further concern. Where a vessel has been coated with a satisfactory brand of bottom paint it is desirable to continue the use of the same compositions, or at least to use a brand closely resembling them; because considerable of the earlier paint will adhere and the film becomes gradually built up to a thick coating, the various layers of which should act together properly. A large user of bottom compositions will usually have an approved list of these paints. Such a list in this country for steel ships will be apt to include some of the following well known makes, and possibly others:

Red Hand	Leonard Miller
Federal	Germicide
McInnes	Amalgamated
International	Reliance
Newport News	

Special Boottopping Paint

In addition to the anticorrosive and antifouling paints, there is a boottopping paint that is applied in the region between the light waterline and the deep load waterline. It is required for the reason that antifouling paints do not stand up well when alternately wet and dry, and also because the usual topside paint does not offer sufficient abrasive resistance to the action of the waves. Good practice on steel ships is to apply one or two coats of anticorrosive paint, as may be necessary, from the keel to the deep load line, one coat of antifouling from the keel to the light waterline and a coat of boottopping from the light waterline to the deep load line. On both steel and wood ships there should generally be a first coat of priming paint. The only exceptions to this are cases where a kind of bottom composition is used that is known to give better results with the anticorrosive paint applied to the bare steel.

*Member of the firm of Rossell & Thayer, naval architects and marine engineers, Philadelphia, Pa.

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REQUIREMENTS OF BOTTOM COMPOSITIONS

Essential requirements of bottom compositions, in addition to the fact that each coat should perform its particular functions, are that they can be applied rapidly and will dry rapidly. In many cases a vessel will go into dry dock, have the bottom cleaned and painted and be out again the same day. It is desirable that the antifouling paint differ somewhat in color from the anticorrosive paint, so that failure to properly coat any portions of the surface can be readily detected.

The poisoning element in antifouling paint is heavy and tends to settle to the bottom of the container and even to the bottom of buckets used while applying it. It is therefore necessary to stir it up thoroughly and frequently.

About 20 years ago the U. S. Navy Department began testing a number of different anticorrosive and antifouling paint mixtures at the U. S. Navy Yard, Norfolk, Va., with a view toward developing a paint of their own; and the results of this investigation together with a lot of valuable information about bottom compositions are given in an article by Mr. N. E. Adamson, assistant shop superintendent of that Navy Yard, in the August and September, 1922, issues of this magazine. The formulæ of the antifouling and anticorrosive paints there given show the characteristic composition of these paints, and the uses and values of the different ingredients are very clearly set forth by Mr. Adamson, who also points out the possibility and desirability of having one kind of paint for both the anticorrosive and antifouling duties. The tests are not yet completed.

Of 21 formulæ first tested at the Norfolk Navy Yord, formula 17 for anticorrosive paint and formula 19 for antifouling paint gave the best results and were found to greatly exceed the merits of the proprietary paints compared with them. They have been adopted by the Navy Department, except as to the kind of alcohol, and are as follows:

	Quantities Required for 1 Gallon	
	Anticorrosive	*Antifouling*
Grain alcohol	3 qts.	4 pts. 3 gills
Gum shellac, Grade A	13 oz.	1 lb. 8 oz.
Turpentine	2 gills	3 gills
Pine Tar Oil	2 gills	3 gills
Zinc Oxide, dry	3 lbs.	1 lb. 8 oz.
Zinc dust	1 lb.	x
Indian red, dry	x	1 lb. 8 oz.
Mercuric oxide, dry	x	12 oz.
Weight per gallon	11 lbs. 8 oz.	10 lbs. 8 oz.

These formulæ were adopted by Dr. P. H. Walker of the Bureau of Standards and Dr. H. A. Gardner of the Institute of Industrial Research in the paint specifications prepared by them in 1917 for the U. S. Shipping Board Emergency Fleet Corporation, except that the grain alcohol was denatured by the addition of 5 gallons of approved wood alcohol to each 100 gallons of grain alcohol, the oxide of mercury was reduced to 8 ounces per gallon, and silica, to the same amount as the Indian red replaced it in the antifouling paint. Tests made by the Norfolk Navy Yard on modifications of the above formulæ had indicated that Indian red was not a desirable pigment for an antifouling paint and that better results would be obtained by the substitution of silica. Requirements of the Emergency Fleet Corporation specifications were as follows:

ANTICORROSIVE BOTTOM PAINT

The paint shall be furnished in prepared form ready for application. It shall be made of the ingredients in the proportions given. The shellac shall be thoroughly dissolved in the alcohol before mixing and milling with the other ingredients.

The zinc dust used shall contain not less than 90 percent metallic zinc as such, the balance consisting mainly of zinc oxide. The pigment portion of the paint shall be of such fineness that 98 percent shall pass through a 300 mesh screen.

The paint must be satisfactory in every respect, including body and freedom from objectionable settling or hardening in the can. The paint must have satisfactory working qualities, hiding power, drying value, and color. It must be resistant to sea water.

ANTIFOULING BOTTOM PAINT

The paint shall be furnished in prepared form ready for application. It shall be made of the ingredients in the proportion given. The shellac shall be thoroughly dissolved in the alcohol before mixing and milling with the other ingredients.

The paint shall be tinted with lampblack to a color approximately that of the low visibility gray for hulls, a color card for which is to be seen at each district office.

The paint must be satisfactory in every respect, including body and freedom from objectionable settling or hardening in the can. The paint must have satisfactory working qualities, hiding power, drying value, and color. It must be resistant to sea water and poisonous to marine growths.

BOOTTOPPING PAINT

The paint shall be a zinc oxide paint in a vehicle of best quality water resisting varnish, with volatile thinner, which may be either turpentine or mineral spirits, or a mixture of these, and liquid drier.

The paint shall contain not less than 35 percent by weight, of pigment.

The pigment shall consist of zinc oxide tinted to the desired slate color with lampblack. (Leaded zinc oxide may be used, but in any event the total pigment must contain not less than 93 percent zinc oxide.)

The vehicle portion of the paint should contain at least 40 percent varnish which should comply with the specification for Emergency Fleet Corporation Varnish, the balance to consist of linseed oil, drier, and turpentine or mineral spirits.

The paint must be satisfactory in every respect, including body, freedom from objectionable settling or caking in can, working qualities, hiding power, fineness, drying, color, gloss, and durability under alternate exposures to sea water and air.

These specifications were adopted in 1918 by the War Service Committee of the Paint Industry.

One of the shipyards has for a number of years manufactured Navy standard bottom paints to Navy specifications and used them on all of the Government vessels built at their plant. In recent years they have been under contract with the U. S. Shipping Board to furnish bottom compositions to Shipping Board specifications for several ports. The ingredients used and their amounts reduced to a per gallon basis are as follows:

Anticorrosive

Alcohol	2.92	qts.
Gum Shellac	12.8	oz.
Turpentine	1.92	gills
Pine Tar Oil	1.92	gills
Zinc Oxide	2.84	lbs.
Zinc Dust	.96	lbs.

Antifouling

Alcohol	2.4	qts.
Gum Shellac	22.1	oz.
Turpentine	3.2	gills
Pine Tar Oil	3.2	gills
Zinc Oxide	22.1	oz.
Indian Red	22.1	oz.
Oxide of Mercury	12.0	oz.

Boottopping

Spar Varnish	4.25	pts.
Drier	2.19	pts.
Mineral Spirits	.85	pts.
Venetian Red	2.91	lbs.

This company for a number of years has also been manufacturing proprietary bottom compositions similar to the Navy standard paints but with some substitutions that enable them to be sold at little more than half the price of the Navy standard paints. These include the use of rosin oil varnish instead of shellac and alcohol, and part turpentine substitute instead of all pure turpentine, in the anticorrosive paint, and the use of some coal tar naphtha in both the anticorrosive and antifouling paints. The boottopping paint is practically the same as above given. The manufacturers are in a position to observe the results of actual service of these compositions, in comparison with the Navy standard compositions, which gives considerable weight to their claims for these proprietary paints.

Antifouling paints which contain copper as the poisoning element have generally been considered undesirable on steel ships on account of the galvanic action set up between steel and metallic copper when in salt water which results in a rapid corrosion of the steel. However, some proprietary paints of this kind are often used on steel ships. One of these has approximately the following analysis:

	Anticorrosive	*Antifouling*
Pigment	40%	60%
Vehicle	60%	40%

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Zinc oxide	7.5%	11.0%
Iron Oxide	32.0	24.5
Copper Oxide	x	22.0
Talc	x	2.5
Quick drying varnish	37.5	20.0
Pine tar and naphtha	23.0	20.0
	100.0%	100.0%

A test made on a submerged plate, referred to by Mr. Adamson, in which cuprous oxide replaced the mercuric oxide in the Norfolk Navy Yard paint, showed after five months a film that was harder and more free from rust than the standard film, although it also showed that the copper paint would not prevent barnacles from becoming attached to the steel. The safer plan, however, is to use the mercury paints on steel. Copper paints are favored for wood ships.

Specifications for copper paint adopted by the U. S. Shipping Board Emergency Fleet Corporation for their wood ships are as follows:

The paint shall contain finely ground natural iron oxide. This oxide shall contain at least 40 percent Fe_2O_3. It shall also contain copper oxide in amount sufficient to insure not less than 12.5 percent by weight, of copper in the completed paint.

The total pigment shall be not less than 44 percent, by weight, of the paint.

The non-volatile vehicle shall be not less than 30 percent, by weight, of the paint. The paint must dry satisfactorily to a tough salt water resisting film. It must have satisfactory working qualities, freedom from objectionable settling or caking in can, must be suitable for use on wood bottoms and have good antifouling and protective properties. The bottom of the vessel up to the light water line will have three coats of Standard Copper Paint.

Specifications prepared in 1918 by the War Service Committee of the Paint Industry followed the above very closely. They were as follows:

Pigment 44 percent.
Liquid 56 percent.

The pigment portion shall consist of finely ground natural iron oxide. This oxide shall contain at least 40 percent Fe_2O_3. It shall also contain finely ground copper oxide in amount sufficient to insure not less than 12.5 percent of copper (Cu) in the completed paint.

The liquid portion shall consist of pine tar oil, drier and suitable thinners. The non-volatile liquid shall be not less than 25 percent of the paint.

Special requirements: The paint shall dry satisfactorily to a tough salt water resisting film and shall be suitable for use on wood bottoms and have good antifouling and protective properties.

One of the proprietary copper paints on the market has as its ingredients rosin oil varnish, coal tar naphtha, Venetian red and oxide of copper.

As with bottom compositions for steel ships, there are a number of proprietary paints on the market that have proved their worth in actual service; and the designer, owner or operator will usually find it to his advantage to approve the use of one of these paints. Approved lists may be expected to contain such brands as:

Woolsey	Cape Cod
New Jersey	Newport News
Baltimore	International
Cape Anne	Davis

Some of the proprietary paints contain more copper than called for by the above stated formula, and should be expected on that account to give better protection. Although the formula contains the amount of copper called for by the Navy Department and they have found after testing and examining a large number of paints of various formulæ that their paint with 12½ percent metallic copper fully met their requirements, the very best copper paint is none too good a protection in some waters.

Three coats of copper paint of good quality may be expected to afford good protection for a period of about six months against marine wood borers although complete metal or wood sheathing is the only certain protection. Cementing the seams is of value in this connection. Wood ships should not be laid up in salt water, if it can be avoided, although northern waters that have not in the past been infested with marine wood borers are reasonably safe.

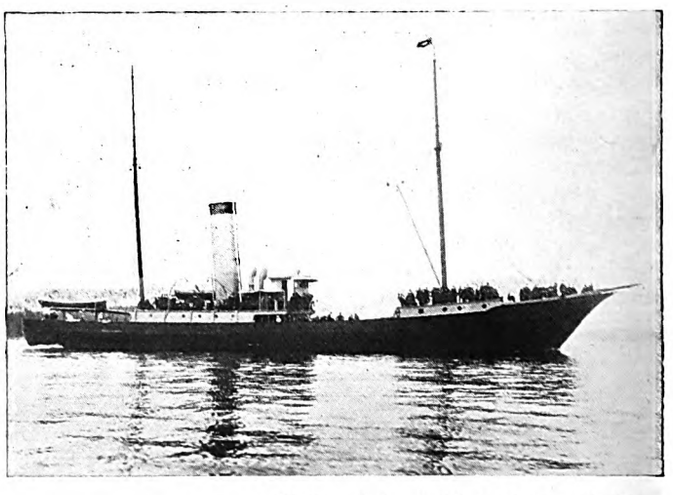
Auxiliary Vacuum Pumps Used to Advantage

ABOUT three years ago one of the 12,000-ton Lake freighters was having considerable difficulty in maintaining proper vacuum, particularly while maneuvering in and out of port. Incidentally, this difficulty is not by any means uncommon. However, a remedy was found for the trouble in this case.

This particular ship had a ballast pumping installation consisting of two 14-inch centrifugal pumps and two reciprocating pumps for drainage. The pumping installation had been made with a connection from the condenser to the manifold so the engineer on the ship, as an experiment, started up the ballast pumps to see if they would help the vacuum any. He found a decided gain, especially when in maneuvering it was necessary for the engine to turn over slowly. Soon after this, an auxiliary air unit, consisting of two radojets, was installed and these, in conjunction with a turbo tail pump, are used for port service and at sea, if for any reason it is necessary to shut down the main air pump and also when an additional vacuum is desired for maneuvering. This auxiliary system can be operated at about 75 percent of the capacity of the main pump.

In general this system has been so satisfactory that all new vessels built for the steamship company on which the first unit was tried out will be equipped with radojets and a turbo pump as the main unit and not for auxiliary service alone.

NEW INTERCOASTAL SERVICE.—The Intercoastal freight and passenger service recently announced by the United American Lines will be opened by the steamship *Sudbury,* which will sail from Baltimore on September 8 and from New York, September 13. Fourteen modern vessels will operate in a weekly service between Baltimore and New York, Los Angeles Harbor, San Francisco, Portland, Seattle and Tacoma.



(Photograph by Kadel & Herbert, N. Y.)

Famous North Pole Ship Becomes a Tug

The *Roosevelt,* famous exploring ship which carried the expedition of Admiral Robert E. Peary to the North Pole in 1909, and which has lain idle in Puget Sound for several years, has been purchased by a barge company and will be converted into a sea-going tug. The *Roosevelt* was built in Portland, Me., in 1905, and was associated with all the exploring expeditions of Admiral Peary. In 1915 the Government purchased the vessel and used it for several years in the Coast Guard service. The *Roosevelt* has a solid oak ice crusher bow, 24 feet thick. When the carpenters finish with her she will be one of the staunchest and most powerful tugs on the Pacific.

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Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Life of Chain Cable

Q. (1,210).—Chain cables must be renewed when ⅛ thickness in diameter has worn out. If so, how many years are chain cables good for resistance against the corrosion of salt water—any accidents being out of the question? K. S.

A. (1,210).—This question can only be answered in a general way because very little trustworthy information upon the subject is available. First class wrought iron chain may be considered to have a life of about ten years. The distorting and stretching of the links of the cable by excessive strains during proof tests and service eventually result in failure to engage the wildcat lugs properly. Probably this is as often the cause for its discarding as is the wastage due to corroding.

Most Economical Steam Pressure at Engine

Q. (1,211).—We have a twin screw job developing 2,200 indicated horsepower at 130 revolutions per minute, the high pressure valves cutting off approximately 64 percent of the stroke, and boiler pressure at 150 pounds, and throttle full open. For certain reasons we have cut the revolutions per minute down to 115, and I cannot shut the high pressure link in far enough to give me the required speed with throttles full open; I put a liner 1-inch thick back of the drag link brasses, but even that is not enough, and they will not stand any more.

My problem is this: Which is the most economical way of running (a) to use full boiler pressure and throttle to the required revolutions; or, (b) to cut down boiler pressure to give the required revolutions and run with throttles full open. In our case 135 pounds boiler pressure will give the required revolutions.

The proper way of course is to run at full boiler pressure, throttles full open and link up, or put lap on valve and advance sheave, but I cannot do this at present, so I have to do the next best thing. I cannot find any definite information in any of my books and would like this matter discussed, and the reasons for and against.

A. (1,211).—It has been found from experimental trials that it is not so economical to carry high steam pressure on the boiler and throttle down to the pressure required, as it is to carry the boiler pressure at about 25 pounds above that desired in the high pressure chest. In the case of a triple expansion engine the boiler pressure can not be dropped much below 100 pounds. A still lower desired pressure in the high pressure chest makes throttling necessary. Several factors enter into the making of this limiting pressure of 100 pounds.

Should there be a reducing valve in the auxiliary steam line the main steam could not be lower than its setting. Again, such auxiliaries as generators, main feed pumps and fire room blowers may begin slowing down to the point where they will fail to function properly even though no ill effects are shown in the running of the main engine.

High boiler pressure with a fireroom force of little experience has the advantage of requiring less careful attention in holding conditions constant and insures a safe steam reserve for maneuvering, but it has the disadvantage of increasing the heat loss by radiation and water loss from leakage. While throttling may produce some superheat, yet it will not be sufficient in amount to be of material value.

Reducing Valve in Steering-Engine Steam Line Dangerous

Q. (1,212).—Is there any economy in installing a reducing valve in a steering-engine steam line, where we are at present running under 150 pounds pressure, the reduced pressure to be say 65 or 70 pounds per square inch? Please give reasons.

A. (1,212).—Steering engines are constructed to take steam the full length of stroke, and the drying or slight superheating of the steam on the low pressure side of the reducing valve would have no economical value. Inasmuch as you are operating the steering engine on boiler steam it is probable that it was designed for high pressure and would not function properly on low pressure steam. Aside from this, the installing of a reducing valve introduces an element of danger. When a steering engine is wanted it is wanted badly. Should for any reason the valve fail to operate and the steam be cut off, a more or less serious casualty to the vessel might result. A relief valve and steam gage should always be fitted on the low pressure side of the reducing valve, and there should also be a by-pass connection around the valve.

Fuel Oil Consumption

Q. (1,213).—In good practice, what is the average consumption per indicated horsepower with fuel oil? Is 1.78 pounds of oil per indicated horsepower for all purposes excessive?

A. (1,213).—The fuel oil consumption per indicated horsepower varies not only with the power and service of the vessel in question but with the skill of the operating personnel, the tightness of joints, the condition of the vessel's bottom as to foulness, weather, etc. The following figures are based upon what may actually be expected under average service conditions covering a long period of time and not upon what might be expected under fairly good conditions, and may therefore seem somewhat high.

Deadweight Tonnage	Indicated Horsepower	Pounds Oil per Indicated Horsepower, all purposes.
3000 to 4500	1000 to 1200	1.75 to 1.6
5000 to 6000	1500 to 1800	1.6 to 1.5
7000 to 8000	2000 to 2250	1.5 to 1.4
8000 to 9000	2400 to 2800	1.4 to 1.30
9000 to 10000	2800 to 3000	1.30 to 1.25
10000 to 12000	3000 to 3600	1.25 to 1.20
Over 12000 (tank steamers)	4000 to 6000	1.20 to 1.15
Intermediate liner		1.15 to 1.10
Large passenger liner		1.15 to 1.10

Use of CO_2 Recorders

Q. (1,216).—Is the CO_2 recorder used to any extent in marine work in the United States, and who supplies these instruments?

A. (1,216).—The CO_2 recorder is not used to any great extent in the merchant service, but it is believed that engineers are beginning to see its value more and more as a fuel saver.

Among those manufacturing CO_2 recorders may be mentioned: The Chadburn (Ship) Telegraph Company of America, Inc., Troy, New York; The McNab Company of Bridgeport, Conn.; Foxboro Company, Foxboro, Mass., and Schaeffer and Budenberg Manufacturing Co., New York.

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LETTER TO THE EDITOR

Combined Riveting and Welding

Referring to the editorial in the July issue of MARINE ENGINEERING AND SHIPPING AGE under the above heading, the writer is in favor of combined riveting and welding where such construction is not too expensive.

We still have considerable to learn about welding, but there is no question but that welded joints will hold when they are properly made. The writer has had experience with both kinds of welded joints—those that hold and those that let go. The principal objection to the welded joint is the old so-called "personal factor" which is present but not to the same extent in the riveted joint. Besides, the welded joint does not lend itself so readily for inspection and testing. It is easy for a poor welder to "cover up" his poor welding.

It has been demonstrated in the making of tanks that the addition of welding is beneficial for two reasons—first, it makes the joint stronger, and, second, it makes the joint leakless and calking becomes unnecessary.

As for the questions which are asked, "Will a combination of riveting and welding work in unison or will the weld which unites the metal in one piece take the entire load and the elastic limit of the joint be reached before the rivets begin to work?" This question can hardly be answered positively because so much depends upon the nature of the weld. If properly done, there can be but little question that the weld and the riveting will act in unison, but there is no telling in advance or possibly even after the welding is done that the two will work in unison and we must "take a chance" just the same as we are taking chances right along even with riveted work, and for which we use a factor of safety in nearly all engineering practice. By carefully annealing the welding after it is finished it is quite probable that the welding and riveting will act in unison. If the welding is not annealed, the chances are that there will be some internal stresses and both the riveting and the weld will be stressed somewhat due to the initial welding stresses and even before the load is applied. This is not alone "theory"—it has been proved in practice.

As for the second question—"If riveting cannot be depended upon for such a connection why not make an entirely welded joint?" The answer is already partially given. Neither joint is absolutely dependable. Nothing is absolutely perfect. But by both welding and riveting the joints we have a "duplication" which is usually desirable for the same reason that two pumps on boilers are desirable, two main steam lines in the power plants, two boilers, two engines, etc. To my way of thinking a joint that is both riveted and welded is more dependable than one that is only riveted or only welded. Some exhaustive tests on this subject are surely needed by the engineering world.

New York. N. G. NEAR.

PERSONAL MENTION

M. C. JACKSON has been appointed general superintendent of the Philadelphia-Norfolk Steamship Company, with headquarters at Norfolk.

M. M. VIPOND, known among the shipping men of the Port of Norfolk for many years as the special deputy collector of customs, has assumed the title of Assistant Collector of Customs.

A. W. DAVIDSON, former representative of the United American Lines at Hamburg, Germany, has assumed the duties of marine superintendent of the United American Lines at 39 Broadway, New York.

W. K. SEMPEY, formerly with the China Mail Steamship Line, has been appointed general freight agent of the Los Angeles Steamship Company, succeeding G. C. Foster, resigned, and will have headquarters at Seattle.

JAMES T. STEWART, formerly superintending engineer for the Army Transport Service at Brooklyn and Hoboken, has accepted the position of assistant port engineer for the Division of Operations, U. S. Shipping Board, New York District.

E. H. WEATHERSPOON, marine electrical engineer, has opened an office at 149 Broadway, New York, and will act as eastern representative for manufacturers of marine equipment, including the Charles J. Henschel Company, Inc., of Amesbury, Mass., electrical engineers and manufacturers.

JAMES GEISTMAN has been appointed general manager of the Marine Iron & Shipbuilding Company, boiler makers, shipbuilders, machinists and foundrymen, foot of Eleventh Avenue West, Duluth, Minn. John Abernethy is general superintendent, B. J. Roberts, assistant superintendent and John Sinclair, repair superintendent.

H. J. WAGNER has been formally installed as traffic commissioner of the Norfolk and Portsmouth Freight Traffic Commission. H. V. C. Wade, who prior to the organization of the Commission was traffic manager of the Norfolk-Portsmouth Chamber of Commerce, is assistant traffic commissioner of the new body.

W. A. MILLER, formerly port engineer of the Baltimore Steam Packet Company, at Baltimore, has been appointed by W. L. Seddon, vice-president of the company, as superintendent to succeed the late Captain J. H. Delano. Mr. Miller has been with the Old Bay Line for several years and is thoroughly familiar with the position.

J. S. MAHOOL has been appointed traffic manager of the Panama-Pacific Line of the International Mercantile Marine Company, which will resume service, interrupted in 1915, between New York and California. For the past three years Mr. Mahool has been assistant general manager of the Red Star Line in Antwerp. He is a native of Maryland, and has been in the service of the International Mercantile Marine Company since boyhood. His headquarters will be at 1 Broadway, New York, and he will have charge of both passenger and freight business of the coast to coast line. The ships selected to open the new service, the first sailing of which is scheduled for October 18, from New York, are the *Kroonland, Finland* and *Manchuria*.

FREDERICK W. COWIE, consulting engineer of the board of harbor commissioners of Montreal, has been appointed expert advisor of the Hampton Roads (State) Port Commission. The immediate duties of Mr. Cowie will be to aid the state commission in preparing a report and recommendations to the next General Assembly of Virginia, visualizing the future of Hampton Roads as a state asset, and showing how the state will be benefited by participation in its expansion and its development. Mr. Cowie has spent thirty-six years with the St. Lawrence Ship Channel and board of harbor commissioners of Montreal, being chief engineer of the latter from 1907 until last year. During his term in that capacity he supervised the construction at Montreal of what is considered one of the most successful terminal projects in the east. The terminals are self-supporting and are building a surplus. Included in recent work Mr. Cowie has done on the Atlantic seaboard are surveys and reports, with recommendations on the harbor of Boston and a comprehensive plan on the development of Savannah as the state port of Georgia.

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The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes of Interest in All Branches of the Marine Industries

Southern Pacific Asks Bids for New Passenger Vessel

PRELIMINARY plans and specifications have just been completed by the Southern Pacific Company for a combined passenger and freight ship and sent out to various shipyards for estimates on the cost of construction.

This vessel, which is to be used in service between New York and New Orleans, will probably be followed by a second vessel, the plans for which are now being considered by the company. Bids submitted on the present vessel will be taken under consideration for further action about September 30.

Estimates have been made by the shipbuilding companies, to whom plans have been submitted, on a vessel 445 feet length overall, 427 feet length between perpendiculars, beam 57 feet, depth to hurricane deck 37 feet 6 inches, draft 25 feet 6 inches, with a deadweight tonnage of 7,000 at this draft. She is to be a single screw vessel, driven by double reduction geared turbines of 6,000 brake horsepower. The vessel will have a speed of 15½ knots. Steam will be supplied at 250 pounds pressure by six oil-burning watertube boilers, at about 75 degrees superheat.

No efforts will be spared in making this vessel one of the most luxurious of the ships in coastwise service. Cabin arrangements allow for commodious lounge rooms, dining salons and promenade decks. She will be fitted to carry 237 first class passengers and 111 steerage passengers.

City of Los Angeles to Be Reconditioned

IT is reported that the steamship *City of Los Angeles,* formerly the *Aeolus,* operated by the Los Angeles Steamship Company between West Coast ports and Honolulu, is to be reconditioned and fitted with new boilers and propelling machinery.

Bids have been submitted on turbines for this vessel by various builders of marine turbines. Prices have also been given on both single and double reduction gears by certain of the gear manufacturers.

Captain Pillsbury, of Pillsbury & Curtis, San Francisco, Cal., is carrying on negotiations for boilers with oil burning equipment for this vessel. Work on the refitting of this vessel will necessarily include structural changes in the bunkers to accommodate them for carrying fuel oil.

S. O. Tug to Be Rebuilt

INFORMATION has been received by MARINE ENGINEERING AND SHIPPING AGE that the Standard Oil Company of New York has decided to practically rebuild tug *No.* 1 of the New York fleet. This tug, which is 100 feet in length, will also require new boilers.

American Marine Association Announces Plans for the Third Annual Exposition Nov. 5-10

THE American Marine Association will hold its Third Annual Marine Show in the Grand Central Palace, New York City, during Marine Week, November 5-10. This is the same week that the American Marine Congress will convene in New York, so that the combination of the two will beyond a doubt bring to New York the greatest marine gathering ever held anywhere in the world.

Practically every person interested in ship operation, building, repairing and allied lines will be present at that time, as the success of their business depends to a great measure on what is done by the Congress.

On the other hand, New York will be full of manufacturers, farmers, producers and shippers, who have things to ship in our vessels. They are coming with a view of bettering their business operation, namely, securing more profitable and advantageous ways of shipping their goods.

Much can be shown to these people by the marine fraternity, through the Marine Exposition.

This interest has never before been displayed in shipping affairs, so the committee in charge of the Marine Exposition this year feels that it has become in addition to its present function a matter of transportation in all its phases.

Transportation facilities will be highly developed in the Exposition; harbor, ports, terminals and shipping projects will be shown, together with all modern and economic handling facilities.

The committee in charge of the Exposition has been named and is as follows:

Edward A. Colson (chairman), chief operating engineer, Babcock and Wilcox Company.
J. Tiebout, Jr., Secretary, W. & J. Tiebout.
G. E. Lawrence, Sales Agent, Bethlehem Shipbuilding Corp.
R. C. Burnside, President, Asbestolith Mfg. Co.
C. Van Zandt, Gen. Mgr., Fire Detecting Wire Corp.
A. Schlueter, President, New Process Chemical Co.
F. W. Sterling, President, Sterling Cooper Corp.
P. S. Thorsen, President, P. S. Thorsen & Co.
Gardner Cornett, President, Pneumercator Co.
H. M. Lee, President, Lee and Simmons.
W. A. Reynolds, Field Engineer, Lunkenheimer Co.
H. Seip, New York Representative, Adams and Westlake Co.
G. E. Barker, Manager Eastern Zone, Crane Company.
R. B. Lea, Manager Marine Dept., Sperry Gyroscope Co.
John T. Borden, New York Manager, Sun Shipbuilding Co.

The chairman, Edward A. Colson, reports that already approximately 60 percent of the available exhibit space has been reserved.

Marine Congress to Foster Diesel Engine Development—Committee Organization Outlined

IN a recent interview with K. Warren Heinrich, secretary of the American Marine Association, which organization has called the American Marine Congress for November next, it was learned that one of the important activities of the Congress will be to determine upon effective ways and means of fostering Diesel engine development in this country.

To accomplish this end, a Diesel engine committee has been established, the chairman of which is Rear Admiral William S. Benson, U. S. N. (Retired), commissioner of the United States Shipping Board, Washington, D. C.

Admiral Benson is recognized as one of our foremost authorities on Diesel engine development, and he is noted for the unflagging interest he has always taken in the development of the motorship. Under his leadership it is confidently expected that the efforts of this committee will be most productive.

Admiral Benson has given much thought and study to an organization plan for such a committee, and it is learned that his proposed organization, as outlined here, has met with the approval of those charged with the direction of the American Marine Congress:

CHAIRMAN: Rear Admiral W. S. Benson, U.S.N., (Retired), commissioner of U. S. Shipping Board.
EXECUTIVE SECRETARY: K. Warren Heinrich, secretary of American Marine Association.
GENERAL COMMITTEE: To include representatives of all the various fields of activities in the marine and stationary field of internal combustion engines, auxiliaries, and electrical appliances.
EXECUTIVE COMMITTEE: To include a few selected from the general committee and to be men actually engaged in the development of the industry and nationally known for their active interest in the matter.

The following is a list of the classifications of the various groups to be represented, together with the names of the various persons who have been selected for membership in this important committee. Some of those whose names are given have been extended invitations to accept places on this committee, and the others will receive their invitations as soon as they can be prepared and forwarded. In some cases the representatives of various companies have not yet been selected, and in those cases the name of the company is given, it being the

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intention to confer with each company in question and have them designate their representatives:

GROUP (A) Manufacturers of marine Diesel engines: A. B. Homer, Bethlehem Shipbuilding Corporation; Max Rotter, Bush-Sulzer Bros., Diesel Engine Company; M. P. Fillingham, Falk Corporation; A. Ballin, McIntosh and Seymour Corporation; New London Ship and Engine Company; Wm. E. Groesbeck, New York Shipbuilding Corporation; Robert Haig, Sun Shipbuilding and Dry Dock Company; J. F. Metten, William Cramp and Sons Ship and Engine Building Company, and others.

GROUP (B) Manufacturers of small Diesel engines for propulsion or auxiliary purposes: Atlas Imperial Engine Company; G. H. Jernberg, Fairbanks, Morse and Company; S. B. Abrams, Ingersoll-Rand Company; H. G. Trout and Company; Knudson Motors; Mid-West Engine Company; Winton Engine Works; M. L. Katzenstein, Worthington Pump and Machinery Corporation; Union Gas Engine Company.

GROUP (C) Manufacturers of marine auxiliary and electrical equipment; G. H. Jett, Allan Cunningham Company; P. E. Kriebel, American Engineering Company; E. W. Niven, General Electric Company; F. L. Andrews, Hyde Windlass Company; Western Electric Company; W. E. Thau, Westinghouse Electric and Manufacturing Company; W. S. Wilkinson, Bethlehem Shipbuilding Corporation.

GROUP (D) Shipyards and ship repair plants: Bath Iron Works; Federal Shipbuilding Corporation; Louis R. Ford, Morse Dry Dock and Repair Company; J. F. Nichols, Newport News Shipbuilding and Dry Dock Company; New York Harbor Dry Docks Company; J. S. Milne, Todd Shipyards Corporation; Vulcan Iron Works; W. and A. Fletcher Company.

GROUP (E) Manufacturers of miscellaneous appliances specially applicable to motorships. (Note: No appointments to be made in this group at present.)

GROUP (F) Manufacturers of stationary Diesel engines: Nordberg Manufacturing Company.

GROUP (G) Ship operators: No representatives have been selected in this group, but it is understood that they will be selected from the following: Baltimore Steamship Company; C. H. Sprague and Son; Luckenbach Steamship Company; Mallory Transport Line, Munson Steamship Lines, Tampa Inter-Ocean Steamship Company. Standard Oil of New York, Standard Oil of New Jersey, United American Lines.

GROUP (H) Advisory Group: A. S. Hebble, Chief engineer of the Southern Pacific Company Lines, New York; Carl E. Peterson, naval architect, United States Lines, New York; Phillip Shore, president, Tampa Inter-Ocean Steamship Company, Tampa, Fla.

Full and complete information concerning the activities of this committee will be given from time to time by the press.

Morgan Yacht Corsair to Be an Oil Burner

WORK has just been commenced on the conversion of J. P. Morgan, Jr.'s, yacht *Corsair* as an oil burner, at the Tebo Yacht Basin Works, Brooklyn, N. Y., of the Todd Shipyards Corporation. The installation of new equipment and necessary structural changes will take about two months for completion.

The arrangement of coal bunkers in the *Corsair* is such that it will be necessary to tear down the present bulkheads and install oiltight bulkheads in their place, it being necessary to have three tanks on each side of the vessel to hold fuel oil for the cruising radius required.

Boiler Equipment

The yacht is fitted with two double end Scotch boilers with three furnaces each, so that twelve fuel oil burners will be used in the installation. The Todd system of fuel oil burning will be used. Additional equipment necessary to complete the work will be two duplex pumps and four fuel oil heaters.

The *Corsair*, when fitted for coal burning, made use of a closed stokehold with blowers located on the upper deck. Natural draft will be employed in the present installation.

Chief Executives of Six Cities to Serve on Delaware River District Committee of Coming Marine Congress

THE mayors of six cities have consented to serve on the Delaware river and Pennsylvania district committee of the American Marine Congress, to be held in New York, November 5-10, according to latest announcement. The district committee, the personnel of which is now virtually complete, is as follows:

Honorary Chairman, Hon. J. Hampton Moore, Mayor of Philadelphia, Pa.; district chairman, W. P. Smith, of the William Cramp & Sons Ship and Engine Building Company; Hon. Frederick W. Donnelly, Mayor of Trenton, N. J.; Hon. Victor King, Mayor of Camden, N. J.; Hon. William T. Ramsey, Mayor of Chester, Pa.; Hon. George W. K. Forrest, Mayor of Wilmington, Del.; Hon. William A. Magee, Mayor of Pittsburgh, Pa.; George F. Sproule, Director of Wharves, Docks and Ferries of Philadelphia; J. S. W. Holton, President, Philadelphia Maritime Exchange; Emil P. Albrecht, President, Philadelphia Bourse; Edward F. Henson, First Vice-President, Philadelphia Board of Trade; William R. Tucker, Secretary, Philadelphia Board of Trade; Charles P. Vaughan, President, Philadelphia Chamber of Commerce; J. H. Mull, President, William Cramp & Sons Ship and Engine Building Company; H. A. Magoun, Vice-President, New York Shipbuilding Company; E. M. Herr, President, Westinghouse Electric & Manufacturing Company; H. T. Herr, Vice-President, Westinghouse Electric & Manufacturing Company; John G. Pew, President, Sun Shipbuilding Company; H. B. Vansciver, Superintendent, Merchants & Miners Transportation Company; E. J. Lavino, President, Lavino Shipping Company; John Hazelhurst Mason, Chairman of the Board, Bank of North America; Galloway C. Morris, Vice-President, Insurance Company of North America; Charles E. Mather, of Mather & Company; S. M. Vauclain, President of the Baldwin Locomotive Works; James W. Rawle, President, The J. G. Brill Company; W. J. Conlen, of Conlen, Acker, Manning & Brown; E. B. Hill, Vice-President, Bethlehem Shipbuilding Corporation; *W. G. Coxe, Vice-President-General Manager, Pusey & Jones Company; *Charles E. Davis, Jr., Manager, Gailey, Davis & Company; *Charles Delaney, President, Kensington National Bank; *John Frederick Lewis, of Lewis, Adler & Lewis. (Those indicated by * are considered practically certain of acceptance.)

Standardization Committee

It is further announced that the Standardization Committee will be composed of the following men:

Captain R. D. Gatewood, chairman; A. B. Bouillon, Director of Simplified Practice, Department of Commerce; E. H. Rigg, Naval Architect of the New York Shipbuilding Corporation; H. G. Smith, Vice-President, Bethlehem Shipbuilding Company; A. W. Whitney, Chairman, American Engineering Standards Committee; Captain C. A. McAllister, American Bureau of Shipping; William F. Gibbs, Naval Architect; C. F. Bailey, Engineering Director, Newport News Shipbuilding Company; William S. Brown, President, Marine Engineers' Beneficial Association.

Other Acceptances

Definite acceptance of the invitation to serve as chairman of the Great Lakes District Committee, covering Minnesota, Wisconsin, Michigan, Northern Illinois, Northern Indiana and Northern Ohio, has been received from F. C. Bradbury, of the Crane Company, Chicago, Ill. Similar action with regard to other committees has been given out as follows:

H. H. Raymond, President, the Clyde Steamship Company, is chairman of the Coastwise Shipping Committee; Robert S. Alter, of the American Tool Works Company, Cincinnati, O., chairman of the Manufacturers' Committee; William H. Kelley, of the Flower Lighterage Company, New York, chairman of the Towing & Lighterage Committee; Admiral William S. Benson, Washington, D. C., chairman of the Diesel Engine Committee; R. H. M. Robinson, President, United American Lines, chairman of the Steamship Owners' & Operators' Committee, and George Carey, Secretary, Omaha Chamber of Commerce, Omaha, Neb., chairman of the Agricultural Committee.

Plans Developing

Rapid strides are reported in the working out of plans for the Congress, interest in the forthcoming event having already become nation-wide. State, municipal and civic bodies, in addition to national organizations throughout the country have signified their intention of taking an active part in the deliberations.

Offers Made for Purchase of the President Arthur

INFORMATION has been received that negotiations are under way for the purchase of the *President Arthur*, operated by the United States Lines, by the Los Angeles Steamship Company through Pillsbury & Curtis, San Francisco, Cal., acting as agents for the line. The *President Arthur* is desired to replace the *City of Honolulu*, recently burned, which was used in the service between Los Angeles and Honolulu.

If the negotiations are successful, the vessel will be reconditioned at a cost of approximately $500,000. Of this sum $250,000 will be spent in the boiler room in fitting new boilers and remodeling the coal bunkers for the carriage of fuel oil. It was decided to fit this vessel with oil burners when it was found that the coal bunkers could easily be changed to carry oil fuel.

The present boiler installation includes three single end and three double end Scotch boilers, which have been in service since the ship was built. It is understood that these will be replaced with boilers of the water-tube type. It will also be necessary to fit new uptakes to the boilers and most of the present piping will have to be replaced to provide for the changes in the same generating plant. New condensers will also be installed.

In addition to the changes in the boiler and engine rooms, it will be necessary to completely recondition the third class passenger accommodations.

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Ocean Shipping Improving; High Costs a Drawback

THAT the ocean shipping situation is improving is disclosed by recent reports of the Transportation Division of the Department of Commerce. It is difficult for ship operators, confronted with the task of making revenue from unusually low rates, to balance with, and perhaps exceed, operating costs, which are still high. Yet fundamental factors, the Commerce Department finds, have become more favorable during the last year.

In the 12 months ended June 30, 1923, the idle steam tonnage of the world declined 2,443,200 gross tons. Of this decrease 1,694,502 gross tons were put into employment during the first six months of this year. The fact that idle tonnage has declined more rapidly in the last half of the past 12 months indicates that the slowly improving overseas trade of the world is gaining momentum. Furthermore, ocean freight (trip charter) rates apparently reached bottom in the last quarter of 1922 at 109 percent of the average for 1913. In the first quarter of 1923 the index rose slightly to 109.8 and stood at 109.5 for the second quarter. While the increase is almost infinitesimal it is significant that there was an increase.

Idle tonnage in British ports decreased from 1,667,000 gross tons on July 1, 1922, to 1,063,500 gross tons on July 1, 1923, but increased 53,500 tons over the tie up tonnage on January 1, 1923. Greece and Australia show an increase in idle tonnage in their ports during the year. On the other hand, the idle fleet of the United States Shipping Board decreased by 155,000 gross tons, and the privately-owned American vessels out of employment on July 1, 1923, were approximately 55,000 gross tons less than on July 1, 1922. Japan, Denmark and Spain show a decline of over 50 percent in vessels tied up in their ports on July 1, 1923, as compared with the year ended July 1, 1922.

Admiral Line Plans Building New Coastwise Liner

IF reports from Seattle are true, the Admiral Line has had plans drawn for a new vessel for their coastwise passenger service. The ship will have accommodations for seventy more passengers than the steamer *Admiral Schley,* of the same line, and will have a speed of about 15 knots. It is said that if the plans for the construction are let, the proposed liner will be one of the finest afloat in the coastwise service anywhere in the world.

Bids for Derrick Boat Hulls

The U. S. Engineer Office, Louisville, Ky., will receive bids about September 25 for six steel derrick boat hulls, 34 feet by 74 feet. Alternate bids on two and on four hulls will be asked. The hulls will cost $10,000 to $15,000 each.

To Build New Equipment

Keystone Sand & Supply Company, of Pittsburgh, Pa., plans to spend nearly $1,000,000 on new equipment, including one sand digger and one large all-steel towboat.

Specifications Issued for One and Two Coastwise Ships for the Old Dominion Steamship Line

PLANS and specifications for the construction of one and two passenger and freight ships for the Old Dominion Steamship Line, of which H. B. Walker is president, have been issued from the office of Theodore E. Ferris, naval architect and marine engineer, and bids were received on August 27. It is believed that if two ships are built it will involve an expenditure of approximately three and a quarter million dollars.

The proposed vessels are to be of the 3-deck, hurricane deck, coastwise type, 375 feet 6 inches in length by 53 feet beam, 20 feet 6 inches depth, with a draft of 17 feet 9 inches. Accommodations are to be provided for about 322 first-class passengers, 58 steerage (white and colored) and 289 immigrants. The ships, which will be about 2,100 deadweight carrying capacity, will be driven by turbine engines with reduction gears, steam being supplied by four Scotch boilers. The engines are to develop 4,750 shaft horsepower and all the auxiliaries are to be driven by steam.

Newport News Shipbuilding Co. Low Bidder for Construction of Two Type "B" Steamers for Clyde Line

THE Newport News Shipbuilding Company, of Newport News, Va., is the low bidder for the construction of two passenger and freight ships for the Clyde Line although no definite contract has been signed as yet, according to information obtained by MARINE ENGINEERING AND SHIPPING AGE. While no official announcement regarding prices has been made it is understood that the contract will involve slightly under two million dollars for each vessel, these figures being for the construction of the "B" type or smaller size steamer.

The "B" type ship, according to the specifications, which were prepared by Theodore E. Ferris, is to have a length overall of 402 feet, beam molded 54 feet, designed load draft 18 feet and a speed of 15 knots. This type of ship is also to have passenger capacity for between 252 and 306 first class and 86 steerage passengers.

Prices were submitted for two type "A" ships, each having a length overall of 425 feet 6 inches, driven by turbine engines, and two type "B" ships, equipped with either reciprocating or turbine propelling machinery.

Bids on the contract were received on July 23 and due to the absence of Clyde Line officials from the city no definite information could be obtained as to when a final contract would be signed.

Manitowoc Shipbuilding Corp. Awarded $1,750,000 Contract for Construction of Two Steamers

THE contract for the construction of two new steamers for the Pere Marquette Railroad, to be used on Lake Michigan, has been signed with the Manitowoc Shipbuilding Corporation, at Manitowoc, Wis. Delivery of the first vessel is promised for March and the second to follow in four months, the outlay involving an expenditure of approximately $1,750,000. When these two ships are completed the railroad's fleet on Lake Michigan will comprise seven vessels.

The specifications for the new steamers provide for an overall length of 360 feet, depth of hold 21 feet 6 inches, depth at center—main to shade deck—17 feet 7 inches, depth at side 17 feet 4 inches, draft 16 feet. The hulls will be of single bottom construction with six watertight bulkheads through the lower hold space and the bows will be cut away for use in ice. Construction will be of steel with two complete decks, the main deck having four tracks and being capable of carrying twenty-six 42-foot cars. Accommodations for passengers and crew will be on the shade deck, the passenger staterooms being equipped with double berths.

PROPULSION

The steamers will be propelled by two vertical, triple expansion, direct acting, condensing engines turning twin propellers. Steam will be supplied by four Scotch boilers, equipped for burning coal under the Howden forced draft system. With the engine turning 92 revolutions per minute and three of the four boilers in use, the boats are to develop a speed of 14 knots under ordinary service conditions.

The steamers will be electrically lighted throughout, the auxiliary equipment including wireless telegraphy.

Shipping Board Gets Two Piers

The two piers at the Army Base at Norfolk, Va., have been turned over to the Shipping Board, by an executive order of President Harding. No agreement has been reached thus far which will permit the transfer of the property to the city of Norfolk, the city having made a bid for the purchase of the base.

The Shipping Board now has the two piers in its custody and it is understood that if the base is sold there will be an arrangement whereby Government owned ships may have the use of the docks and service from the Belt Railroads.

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Bids Open Sept. 7 for Construction of Six Steel Barges

SEALED proposals for the construction and delivery of six steel barges will be received by the United States Engineer Office, 321 Custom House, Portland, Ore., until 10 A. M., September 7. The boats are each to be 120 feet long, of 34 feet beam and 7 feet 6 inches depth, delivery to be at the government moorings, Linton, Ore.

Each boat is to be equipped with eight 36-inch cleats and four 30-inch open chocks, all of cast steel and of approved design, and two hand capstans of American Engineering Company type.

Bids September 10 at Montgomery, Ala., for 6 Steel Barges

THE United States Engineer Office, of Montgomery, Ala., will receive bids until 11 A. M., September 10, for three steel barges 80 feet by 26 feet by 5 feet and three barges 60 feet by 22 feet by 4 feet. One of the 80-foot boats is for delivery at Mobile, Ala.; two at Apalachacola, and the three 60-foot barges are for delivery also at Apalachacola. The boats are to be built with transverse oiltight bulkheads.

One of the three 60-foot barges is to be used as a pile driver hull and one as a drilling barge, certain fittings being required for each.

Bids Sept. 11 on Proposed 19-Barge Building Program

AS previously announced the U. S. Engineer Office, at Louisville, Ky., plans the construction of nineteen steel barges. The time for receipt of bids has been set at 2 P. M., central time, on September 11. The proposed boats are to have a length of 110 feet, beam 26 feet, depth 6 feet 5 inches. Four of the boats are to be built without cargo boxes, 15 with cargo boxes, delivery to be at the locks of the Louisville and Portland Canal, Louisville, Ky.

The time allowed for completion, including delivery, is as follows:

19	barges	216 days
15	barges	240 days
14	barges	240 days
10	barges	220 days
9	barges	210 days
5	barges	200 days
4	barges	200 days

New Nautical College

A charter has been granted by the State Corporation Commission in Richmond, Va., to the United States Nautical College, Inc., of Norfolk, under which name the institution will operate. The institution will have as its purpose the education of students in the management of ships.

The school will train students in the fundamentals of ship operation. Captain William J. Blue has been named as president; Charles H. Drummond, secretary, and Ella Blue, as one of the incorporators. The maximum capital was placed at $5,000 and the minimum at $1,000.

Steamship Typhon to Be Converted as Motorship

THE steamship *Typhon,* owned by the United States Shipping Board, has been purchased by the O'Boyle Lighterage Company, 15 Moore street, New York City. The most important feature in connection with this transaction is the fact that the vessel will be converted as a motorship, and is to be equipped with a 750 horsepower McIntosh & Seymour engine.

Changes in propelling machinery will necessitate considerable reconstruction. Plans and specifications for the work, now available, have been prepared by Whittlesey & Whittlesey, naval architects, New York City.

The vessel has a length of 250 feet, beam 43 feet, depth 24 feet, and is of 3,400 tons deadweight at a draft of 19 feet. When completed, the vessel is expected to do about 9 knots.

It is estimated that three months will be required to complete the work, which will cost approximately $200,000.

To Build Barges and Elevator

It is learned that the West Kentucky Coal Company, of Sturgis, Ky., plans to build several 600-ton coal barges, 136 feet by 26 feet by 9 feet, at its shipyard at Dubuque, Ky. The same company is also considering a $25,000 addition to its coal elevator at Dubuque.

TRADE PUBLICATIONS

COMBINATION GRINDER AND BUFFER.—A pamphlet giving the structural features of the combination grinder and buffer made by the Hisey-Wolf Machine Company, Cincinnati, O., is being sent to the trade. This machine is adapted to work requiring the use of a grinding wheel, buffer wheel, wire brush wheel or rotary wire rasp wheel.

SHIP LANTERNS.—A circular describing a combination lantern applicable to ship service has been sent out by the V. & N. Lantern Company, 256 Broadway, New York. This lantern, it is claimed, is useful as a riding light and deck lantern. It has a white and a red lens, the latter readily adjustable at any time and in any wind.

AMERICAN LIT-O-SIL-O.—The steamship *Leviathan* is decked with American Lit-O-Sil-O and the Marine Decking and Supply Company, Philadelphia, Pa., has made this latest outstanding installation of flooring the subject of a special *Leviathan* pamphlet. In addition to details and photographs of the decks of the *Leviathan,* general information on Lit-O-Sil-O is given.

BOILER TUBES.—An announcement of the New York boiler tube supply service of B. F. Keating Company, New York City, has recently gone out to the trade. Complete stocks of steel, lap welded and seamless charcoal iron tubes, as well as fittings, valves, cocks and plumbing supplies are maintained in the New York district. The card also includes a number of reference tables giving tube data.

ELECTRIC HOISTS.—A book of illustrated economies describing the application of the Shepard electric "Lift About" featuring the slogan "an electric hoist for everybody," has been prepared by the Shepard Electric Crane and Hoist Company, Montour Falls, N. Y., to demonstrate that Shepard hoists are applicable to practically every industry. The book also contains specifications and structural details of the "Lift About."

MECHANICAL SYSTEM OF OIL BURNING.—The system of oil burning known as the "Dahl System" controlled in this country by the Bethlehem Shipbuilding Corporation, Ltd., Bethlehem, Pa., is outlined in a catalogue now being distributed. The new swinging type furnace front is described in detail with illustrations, specifications, and its application. The catalogue also contains a description of the Bethlehem line of pumps for handling oil.

INDUCTION MOTORS.—The construction and application of Type A-A Reliance Induction motors for two and three phase alternating current circuits have been made the subject of a special bulletin by the Reliance Electric & Engineering Company, Cleveland, Ohio. The bulletin is introduced with a short outline of the company's history, leading to the manner in which type A-A motors were designed. Specific details of the motor construction are then given.

CONTROL RELAYS.—Control Relays, to be interposed between the circuit breaker solenoid and control switches are described in bulletin No. 47672 issued by the General Electric Company, Schenectady, N. Y. The relays described are known as the instantaneous control type PB-53 and the hesitating control, type PB-54. These relays are used for the remote control of circuit breakers when it is undesirable to have the control current pass through the control switch.

MODERN FURNACE BUILDING.—The Jointless Fire Brick Company, 9899 Clay Street, Chicago, is offering to engineers and power plant operators a booklet which tells the complete story of the building of monolithic furnace linings. It shows how boiler furnaces, circular furnaces, pit type brass furnaces and other furnaces may be lined with this jointless furnace lining. Illustrations showing how forms for special shapes, like front door arches, are made are frequent.

SHOP TROLLEYS.—A trolley folder has just been issued covering the new Yale trolleys. It is the first piece of literature to be issued on this equipment, and contains, in addition to detailed descriptions of the plain and geared types of the new Yale steel plate roller bearing trolleys, a description of the new Yale cast-iron trolleys. Incorporated in it are details of interesting tests to which the new steel plate trolley was subjected, and a complete list of the material-handling equipment manufactured by the Yale & Towne Manufacturing Company, Stamford, Conn.

INJECTOR TROUBLES. — Many companies manufacturing equipment both for marine and stationary service devote considerable time to the investigation of the possible ways in which their equipment may be caused to function badly and to develop the best service and maintenance methods to prevent such difficulties. In the case of the Penberthy Injector Company, Detroit, Mich., many requests from engineers using the Penberthy injector asking for help in locating trouble, caused this company to send out a data sheet giving "Directions for Locating Injector Troubles." It is quite the most complete work of its kind and will prove invaluable to any marine or plant engineer who includes injectors in his equipment. This company will send copies of the pamphlet on request.

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Foreign Shipping and Shipbuilding Activities

Italian Liner Launched at Ansaldo Yard

GENOA, Italy (Special).—The latest addition to the fleet of the Transatlantica Italiana was recently launched in the shipyards of the Ansaldo Company at Sestri Ponente, just outside of Genoa. The new liner is named the *Admiral Bettolo,* after a famous Genoese sea captain, and was christened by the Countess Bettolo. There were present at the launching many civil and military authorities, and officials of the Transatlantica Italiana.

The *Admiral Bettolo* is the product of Italian labor and Italian enterprise, and her engines and entire equipment are Italian. She is the third liner which the Ansaldo Company has built for the Transatlantica Italiana. She will carry a total complement of 1,375 comprising 68 first class passengers, 1,114 third class passengers and 197 members of the crew.

The vessel is 447 feet long, displaces 11,600 tons, and will be capable of a speed of about 16 knots. She will be equipped with 22 lifeboats, one a motorboat, and with a radio outfit of the most modern type. There will be a complete heating and ventilating system, contrived to serve, specially, the hospitals, the third class dormitories, and the stokers' quarters.

The total capacity of the coal bunkers is about 1,880 tons, sufficient for a round trip from Genoa to New York. Among the other features of the equipment are an up-to-date refrigerating plant, and an electric plant.

The new liner will go into service between Italy and South America.

Ellerman Vessel Launched on the Tyne

WALLSEND-ON-TYNE, England.—Built for the Ellerman Lines, Ltd., of Liverpool, the *Lesbian,* a steel single screw steamer, was successfully launched by Swan, Hunter & Wigham Richardson, Ltd., from their Wallsend yard on July 31. The vessel is 271 feet 4 inches long, 41 feet 6 inches beam and 23 feet 9 inches depth forward and 22 feet aft. She has a cruiser-shaped stern, a combined poop and bridge about 172 feet 3 inches long, also a topgallant forecastle of 30 feet, and is rigged as a two-masted fore and aft schooner.

The ship is being built to the highest class of Lloyds, is designed to carry about 3,425 tons on a draft of about 21 feet 3 inches, has three cargo holds with four large hatchways leading to same and eight cargo derricks. Water ballast will be carried in the double bottom, all fore and aft, and in the after peak.

A steel house amidships provides accommodation for the saloon, chief officer, apprentices and stewards, and above this is a steel house with the captain's room and chart room. The engineers and remaining officers are berthed in steel houses abreast the engine casing, the seamen, firemen and petty officers in the forecastle.

The ship is lighted throughout by electricity, and the accommodation amidships is steam heated.

A vertical donkey boiler is fitted for supplying steam to the winches, windlass and other auxiliary machinery.

The engines, which are of the ordinary inverted marine type with three cranks driving a single propeller, also the boilers, of which there are two single-ended ones for a working pressure of 225 pounds per square inch, will be placed slightly abaft amidships and are being built by the Wallsend Slipway & Engineering Company, Ltd., Wallsend-on-Tyne.

France Taking Steps to Improve Shipping; Committees Appointed to Suggest Ways; Shortage of Orders Handicaps Shipyards

By Our Paris Correspondent

THAT France is making strenuous efforts towards a general improvement of the conditions of her shipping trade is shown by recent examples such as the appointment of special committees for the mercantile marine, the measures taken by the Government and the resolutions passed by several congresses and various trade associations and Chambers of Commerce. Both the Government and these associations have been endeavoring for some months to stir up the general opinion in this country in favor of the development of the merchant marine by pointing out the vital importance of the shipping trade for France.

COMMITTEES APPOINTED

The Government has recently appointed a committee of leading personalities in the trade and shipping circles with a view to investigating the actual position of the French merchant marine and making suggestions towards bringing about an improvement in the present conditions of the maritime commerce. This committee, the so-called "Commission Generale Extra-Parlementaire de la Marine Marchande" (General Extra-Parliamentary Committee for Merchant Marine), has already made energetic efforts towards a better utilization of French vessels and a more favorable position of French shipowners as compared to foreign shipowners. The principal schemes and measures which are about to be enforced, thanks to the remarkable activity of the Commission Extra-Parlementaire, are: The organization of joint committees constituted by representatives of shipowners and seamen which is intended to prevent the occurrence of all possible differences between employers and employees such as the strike of September, 1922, which entailed severe inconvenience for the country and losses for shipowners; and the organization of the "Credit Maritime," a régime of loans to shipowners which shall enable the latter to hold out until the prevailing difficulties have disappeared. At the same time the Commission is considering measures in order to reduce the imports of foreign materials or fittings used for the construction of vessels, so as to organize a "self-supply" scheme.

Although the position of the steamship companies has so far not been much improved as shown by the reports for 1922, it is hoped that following the real and extensive efforts made on this side the shipping trade will shortly recover from its uneasiness.

LIQUIDATION OF STATE FLEET

The final accounts in respect of the liquidation of the State fleet have been recently set forth by Mr. Charles Leboucq, a deputy for Paris. While the sum produced by the sale of the vessels owned by the Government since the war amounts to 190 million francs the total expenditure comprising the cost of vessels and the running expenses works out to 1,998 million francs, the liabilities thus amounting to 1,808 millions. Assuming that the amount of interest for four years and various other expenses and duties may be estimated at 740 millions, the total amount of the liabilities amounts to nearly 2,500 million francs. Such figures which represent an enormous sum are far beyond the most pessimistic conjectures which have been put forward in recent years in that respect and it may be anticipated that France is not likely to make any further experiment with a State fleet.

Interesting signs of a slight improvement in trade conditions may be found in the recent decision taken by the French line to establish fortnightly departures (in lieu of monthly) from Havre to the northern and southern Pacific Coast of America.

SHIPBUILDING OUTLOOK

The position of the shipbuilding industry in this country is still showing severe difficulties owing to the shortage of orders for new vessels. Several shipyards, which were about to fail, have been able to carry on work, thanks to orders for warships placed by the Navy. Orders placed by private shipowners have been growing fewer and fewer in the course of the last month and it may be stated that the Messageries Maritimes is the only steamship company which has an important building program under completion. The reason for this is to be found in the fact that this company is receiving the financial support of the Government according to an agreement entered into in 1921.

A big event which has been arousing many comments in shipping circles during the last few weeks is the non-renewal of the commercial "modus vivendi" which had been entered into between France and Portugal in order to establish special low rates for the customs duties in respect of goods imported from one country to the other. The measure was suggested by the French Minister of Agriculture with a view to protecting the interests of the wine-growers of Southern France by opposing the import of Portugal wines. Such development will cause a heavy prejudice to French shipowners by reducing or suppressing the return freight which was taken in Portuguese ports by their vessels on their homeward voyages from North Africa.

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Marine Construction News of the Month

Ship Contracts — New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPS AND SHIPBUILDING

Tug Drydocked, Portland, Ore.—The tug Wallula has been lifted on the Portland drydock preliminary to her transfer to the Hammond Lumber Company.

Ship Work, San Francisco, Cal.—The General Engineering Company is very busy with miscellaneous ship work, including the steamer West Henshaw.

Steamer Drydocked, Cleveland, Ohio.—The steamer W. A. Rogers has been drydocked for repairs to twenty-seven damaged plates received as a result of grounding.

Plate Repairs, Etc., Cleveland, Ohio.—The barge I. L. Bell, which recently had her plates damaged and considerable internal damage as well, has been drydocked for repairs.

Steamer Reconditioning, Philadelphia, Pa.—The steamship Western Spirit was awarded by the Shipping Board to the Cramp Shipbuilding and Dry Dock Company for reconditioning.

Barge Contract Awarded, Fort Mason, Cal.—The Quartermaster, United States Army, Fort Mason, Cal., has awarded the contract for a wood barge to A. W. DeYoung, at a price of $17,250.

Conversion to Oil, Staten Island.—The steamship Kermit, of the United American Lines, is being converted from a coal to an oil burner at the plant of the Staten Island Shipbuilding Company.

Power Boat Repairs, Baltimore, Md.—The power boat, W. J. Townsend, which recently received damage to her propeller and stern bearings, has been taken to the Woodall's shipyard for repairs.

Vessel Repairs, New Jersey.—The contract for general hull and machinery repairs to the steamship West Comak was awarded on August 7 to the Federal Shipbuilding Company, at a price of $21,235.

Steamer Overhauling, Mobile, Ala.—The steamship Cabrille has been hauled out on the docks of the Alabama Drydock and Shipbuilding Company for hull repairs and also some boiler and auxiliary work.

Dredge Reconditioning, Charleston, S. C.—The Charleston Dry Dock and Machine Company has started work on the United States dredge Comstock, which consists of scraping and painting the bottom.

Steamship Overhauling, Boston, Mass.—The Atlantic Works, East Boston, has been awarded the contract for overhauling the steamer Wabash, of the Nawsco Lines. The work will occupy thirty days and cost $16,356.

Annual Overhauling, West Coast.—The coastwise passenger and freight fleet of the Pacific Steamship Company will receive its annual overhauling, the work having been started with the reconditioning of the liner Admiral Schley.

Stern Frame Replacement, Oakland, Cal.—The Moore Drydock Company received the contract for replacing a broken stern frame on the Norwegian steamer Luise Niesen, the work to cover a period of about twenty-two days. Price $18,454.

Vessel Repairs, New York.—At the opening of tenders for damage and bottom repairs to the steamship City of Freeport, of the Tankers Corporation, on Wednesday, August 8, the Alderton Dry Docks, with a bid of $10,500, received the contract for the work.

Wooden Scows, Nassau.—The Government of the Bahamas invites tenders for the construction of two wooden dump scows, having a capacity of 800 cubic yards. Plans and specifications may be obtained from S. R. H. Beard, harbor engineer at Nassau.

Vessel Repairs, New York.—The contract for general repairs and betterments on the steamship Southern Cross has been awarded to the Morse Dry Dock & Repair Company at a price of $22,000, following the opening of bids by the Shipping Board on August 8.

Seasonal Drydocking, Charleston, S. C.—The steamship Cliffwood has been taken to the drydock of the Charleston Dry Dock and Machine Company and the steamship Cody is expected on the docks in the very near future.

Steamship Survey, Oakland, Cal.—Survey of the French Line steamer Alaska, damaged recently in collision, has been made by the Moore Drydock Company, of Oakland, and it was found that the vessel will need a new stem, renewal of some frames and about twenty new plates.

Extensive Repairs, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation has been awarded changes and repairs on the Mexican steamer Korrigan III.; river boat San Joaquin, general repairs, and the tug Sea Queen, of the Red Stack fleet, for propeller installation.

Miscellaneous Work, Oakland, Cal.—The Moore Company is also working on the following contracts: Renewal of six furnaces in the boilers of the tanker San Joaquin, after which the vessel will be drydocked, and drawing the tailshaft and carrying out hull repairs on the steamer Isonomia.

Low Bidders, Derrick Hull, Mobile, Ala.—The Midland Barge Company, of Midland, Pa., with a bid of $21,900, submitted the lowest price for the construction of a steel derrick boat hull, bids for which were received by the United States Engineer Office, at Mobile, Ala., on Monday, August 6.

Scows Ordered, Louisville, Ky.—The contract for the construction of six steel side dump scows, bids for which were opened by the United States Engineer Office at Louisville, Ky., on July 16, has been awarded the Dravo Contracting Company, of Pittsburgh, Pa. The Dravo Company's total bids for the boats was $113,220.

Vessel Conversion, Baltimore, Md.—The Bethlehem Shipbuilding Corporation of Baltimore, Md., has been awarded the contracts for reconditioning the steamers Mount Carroll and Mount Clinton from passenger to freight carriers for the United American Lines, the price for each steamer being approximately $32,725.

Low Bidder, San Francisco, Cal.—The General Engineering and Dry Dock Company submitted the lowest tender at the opening of bids for hull repairs to the steamer West Cactus, with a tender of $959. The other bids were: Moore, $975; Bethlehem, $998; Crowley, $1,270; United Engineering Works, $2,081, and Smith & Scanlon, $2,197.

Tanker Repairs, New York, N. Y.—The tank steamer Bethelridge, operated by the firm of Walker & Daly, has been awarded to the Clinton Dry Dock & Repair Company for drydocking, painting and bottom repairs, to cost about $2,280. A contract on the same vessel was recently completed by the Atlantic Basin Works, totaling about $2,800.

Shipyard Activities, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation, San Francisco, Cal., has received the following contracts: The Norwegian steamer Sinaloa, of the Latin-American Line, for inspection; State tug Governor Irwin, for extensive hull repairs; British tanker Placuna and tanker La Purisma, for miscellaneous repairs.

Shipyard Activities, Baltimore, Md.—The Bethlehem Shipbuilding Corporation has been awarded the contract for repairs to the steamer West Arrow by the Shipping Board at a price of $5,800. The steamship Morristown is on the Baltimore Dry Docks and the Maryland Dry Dock Company is completing repairs on the steamship West Isleta.

Derrick Boats Planned, Rock Island, Ill.—The Chief of Engineers, U. S. Army, has authorized the U. S. Engineer Office, at Rock Island, Ill., to have constructed two steel hull derrick boats, to be 74 feet long by 34 feet beam and 5 feet deep, each boat to have two watertight bulkheads and two spud wells. It is understood that bids will be canvassed shortly.

Bids for Pumps, New York.—Sealed proposals were received by the Superintendent of Lighthouses, Third District, Staten Island, New York, on August 16, for furnishing and delivering a 3-inch by 2-inch by 3-inch horizontal duplex fresh water pump. This pump is to replace a pump of similar size and the new pump must replace old one without alterations to present piping or foundation.

Drydocking Job, New York.—The toss of a coin decided the awarding of a drydocking job on the steamship Prusa, following the recent opening of bids by the Shipping Board. The Morse, Robins, New York Harbor, Crane and Staten Island Shipbuilding Companies each bid $255.65 for the work, the Fletcher yard tender being $300. On the "throw-off" the Crane Company took the job.

Steamer Launched, Newport News, Va.—The steamer City of Chattanooga was recently launched from the yards of the Newport News Shipbuilding and Dry Dock Company. The vessel is for the Ocean Steamship Company and is a 6,500-ton ship, 400 feet in length. She will run between Savannah, Ga., and New York. Her sister ship, the City of New York, is now on the ways and will soon be launched.

Low Bidder for Derrick, Huntington, W. Va.—At the opening of tenders by the United States Engineer Office, Huntington, W. Va., on August 16, the Dravo Contracting Company, of Pittsburgh, Pa., was low bidder for furnishing and delivering a steel derrickboat for the Kanawha River. The proposals were: Dravo Contracting Co., $25,870; Charles Ward Eng. Works, $26,760; Penn Bridge Co., $28,800; Midland Barge Co., $29,700; Independent Bridge Co., $31,000.

Oil Barge, New York.—Plans and specifications for the construction of a 5,000-barrel steel oil barge for the New York Central Railroad have been issued from the office of J. W. Millard, 17 State street, New York City. Bids were received at the uptown office of the New York Central on August 23. The proposed vessel is to be 144 feet long, beam 27 feet, depth 11 feet. It is understood that the equipment will include the "R. & D." heating system.

Miscellaneous Repairs, Mobile, Ala.—The Alabama Dry Dock & Shipbuilding Company, Mobile, has been awarded the following contracts: Towboat Demopolis, engine overhauling, etc.; tug Pinquino, for hull scraping and painting machinery and boiler work; steamship Normania, boiler work; tug Buzzard, electric welding and other boiler repairs; tug Nimrod, installing of two fuel oil tanks, etc.; and tug Marion, placing of new steel decking and various other repairs.

Shipyard Activities, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation has been awarded the following work: Standard Oil tanker Captain A. F. Lucas, general repairs; oil carrier William H. Doheny, general cleaning, painting and miscellaneous work; British tanker Placuna, of the Anglo-Saxon Petroleum Company, placing of rivets in the hull; American-Hawaiian carrier Oregonian, extensive general repairs; the Arizonian, extensive reconditioning.

Pump for Standard Oil Barge.—The Northern Fire Apparatus Company, of Minneapolis, has received

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the contract for rotary pump equipment on the new Diesel-electric barge under contract with the Newport News Shipbuilding & Dry Dock Company for the Standard Oil Company of New Jersey. The boat will be the first on the Atlantic coast with almost complete rotary pump equipment. There will be three cargo and four auxiliary pumps, direct connected to Westinghouse motors.

Vessel Repairs, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation, of San Francisco, Cal., submitted the lowest tender for drydocking and repairing the United States Shipping Board steamer West Calera. The price bid for drydocking the vessel was $1,700 and $17,638 for repairs, with the highest bid for the repairs running approximately $21,000. The West Calera is one of the five freighters being placed in spot condition by the Government, these vessels having been brought to San Francisco from Southampton Bay on the West Coast.

Miscellaneous Repairs, Mobile, Ala.—The Alabama Drydock and Shipbuilding Company has also been awarded the following miscellaneous work: Steamship Hulaco for repairs to machinery, overhauling and assembling of refrigerating machine, boiler work, etc.; the tug Marion for renewal of a number of bulwark plates and various other plates; steamship Gaston for drydocking, cleaning and painting and some propeller and engine work; reconditioning of the steamer Cattleya and the Texas Company's steamship Louisiana, for examination of rudder and scraping and painting.

Vessel Repairs, New York. — Recent contracts awarded the New York Harbor Dry Dock Company include: The Standard Oil tanker Somerset, the Export Steamship Company's steamship West Gotomska, the Norton Lilly steamship City of Madrid, the White Star steamship Gitano, the Tidewater Oil barge Tydol, and two Merritt, Chapman & Scott derricks. Bids submitted on the Somerset were: New York Harbor, $11,899; Robins, $12,656; Staten Island Shipbuilding Company, $14,661. On the steamship West Gotomska the proposals were: New York Harbor, $6,972; W. & A. Fletcher, $6,900; Alderton, $7,300; Shewan, $7,500; Clinton, $7,514; Morse, $7,694; Crane, $7,827.

Bids for Derrick Boats, Nashville, Tenn.—The Penn Bridge Company, of Beaver Falls, Pa., with a price of $58,900, was the low bidder for the construction of two derrick boats with derricks, at the opening of proposals by the United States Engineer Office, at Nashville, Tenn., on August 13. The proposed vessels are to have a length of 76 feet 6 inches, beam 34 feet, depth molded at gunwales 5 feet, the hulls to be built of steel, each having two transverse watertight bulkheads. The tenders submitted for the work were as follows: Penn Bridge Co., $58,900; Midland Barge Co., $64,000; Independent Bridge Co., $67,900; Dravo Contracting Co., $71,750; Nashville Bridge Co., $89,940.

Vessel Reconditioning, San Francisco, Cal.—At the opening of tenders for the reconditioning of three vessels, the General Engineering and Drydock Company, of San Francisco, Cal., submitted the lowest bids. For the installation of an oil burning system on the Mexican Navigation steamers Washington and Bolivan, the prices submitted being for each ship, the bids were as follows: General Engineering, $10,865; Hanlon, $12,675; Main Iron Works, $14,339; Moore Drydocks, $19,750; Bethlehem Ship. Corp., $21,465. The third bid was on the steamer West Henshaw, one of the five vessels withdrawn from the idle Shipping Board fleet to be put in "spot" condition. The following were the prices: General Engineering, $17,505; Main Iron Works, $17,965; Crowley Ship Co., $21,311; United Engineering, $21,735; Hanlon, $21,820; Bethlehem Ship. Corp., $22,591; Moore Drydocks, $24,170.

SHIPYARDS AND DRY DOCKS

Shipyard Purchased, Seattle, Wash.—The Pacific Steamship Company has completed a purchasing deal of 25½ acres of the wartime shipyard of the Skinner & Eddy Corporation, known as the No. 1 plant, and will construct terminals for ocean shipping which will cost several million dollars. The plans provide for three large piers, warehouses of large capacity and a building for the general offices of the Pacific Steamship Company.

Merchant Yard Closed, Chester, Pa.—On September 1 the Merchant Shipbuilding Company's yard on the Delaware River will be closed down permanently, due to the dullness in the shipbuilding industry and the determination of the Harriman interests to concentrate all their efforts in that line at the Cramp Yards, at Philadelphia. When the yard was first owned by John Roach the first four steel ships of the modern American navy were built, the Atlanta, Boston, Concord and Dolphin.

PORT IMPROVEMENTS

Coal Elevator, Paducah, Ky.—West Kentucky Coal Company, Sturgis, plans a coal elevator at the foot of Ohio street, here. $25,000.

Grain Elevator, Louisville, Ky.—R. D. Reidling, 18th and Magnolia streets, plans rebuilding grain elevator recently destroyed by fire. $40,000.

Seawalls, West Palm Beach, Fla.—An election was held on August 14 for the purpose of voting on $100,000 bonds for seawalls. K. Riddle, city manager.

Contract Rescinded, Sanford, Fla.—The city of Sanford rescinded the contract for a pier and yacht basin. Will re-advertise. F. T. Williams, Sanford, engineer.

Canals, Caledonia, Minn.—Plans are being prepared for 4,700 lineal foot canals to take care of flood waters of Mouse River. $266,250. W. W. Peterson, city engineer.

Harbor Improvements, Oshawa, Ont.—The Dominion Government, Ottawa, voted $50,000 for harbor improvements here, hydraulic dredge work. K. M. Cameron, chief engineer.

Grain Elevator, Edmonton, Alta.—The Department of Public Works, Railways and Canals, Ottawa, plans grain elevator here, $200,000. K. M. Cameron, acting chief engineer, Public Works.

Pier, Charleston, S. C.—Sealed proposals will be received by the Port Utilities Commission, Room 712, Peoples Building, for construction of Union Pier. H. M. Gallagher, general manager.

Grain Elevator, Halifax, N. S.—The Department of Public Works, Railways and Canals, Ottawa, plans a grain elevator here, $200,000. K. M. Cameron, acting chief engineer, Public Works.

Contract Placed, Ottumwa, Ia.—Wapello County awarded the contract for a drainage ditch and improvements in Cedar Creek Drainage District to Rude & Wold, Pomeroy, at a price of $35,281.44.

Wharf, Blind River, Ont.—The Department of Public Works, Ottawa, awarded the contract for reconstructing timber wharf, pile foundations, to T. P. Charleson, 179 Gilmour street, Ottawa, $25,000.

Drainage Canals, Levees, etc., Rayville, La.—Tensas Basin Levee Association plans to build 75-mile drainage canals, levees, etc., to protect 1,250,000 acres in northeastern section of state. $3,500,000.

Hydraulic Dredging, Sault Ste. Marie, Ont.—The Department of Public Works, Parliament Buildings, Ottawa, plans hydraulic dredge work in harbor here. $60,000 bonds voted. K. M. Cameron, chief engineer.

Pier, Hamilton Beach, Ont.—The Department of Public Works, Parliament Building, Ottawa, voted $50,000 bonds for pier (mostly wood construction) at Hamilton Beach. K. M. Cameron, chief engineer.

Landing and Facade, New Orleans, La.—The Board of Port Commissioners, New Court Building, will take bids about October for extending the Poland Street wharf, 400 feet long and 230 feet wide.

Pier, San Diego, Cal.—The City Council awarded the contract for Contract B, on Municipal Pier 2, comprising concrete apron wharf for mole type pier, to F. H. Doran, 3735 Seventh street, at a price of $292,700.

Levee, Caledonia, Minn.—Houston County Drainage & Conservancy District 1, plans levee and pumping station. $428,000. Central States Engineering Company, 602 Laurel Building, Muscatine, Iowa, engineers.

Grain Elevator, Tiffin, Ont.—The contract for a 2,500,000-bushel elevator at Tiffin has been awarded to Fegles Construction Company, Fort William, by the Canadian National Railroad Company, 230 St. James street, Montreal, Que.

Levee, Bridge Junction, Ark.—Sealed proposals were received on August 15 by the St. Francis Levee Board for 32,000 cubic yards of excavation in ditch construction work adjacent to levee in Lee County. H. N. Pharr, chief engineer.

Elevator, Vancouver, B. C.—Harbor Commissioners, 712 Pender street, West, awarded the contract for superstructure of addition to Elevator No. 1, reinforced concrete, to Pacific Construction Company, Ltd., foot of Salisbury Drive, $350,000.

Grain Terminal Improvements, San Francisco, Cal.—The Board of Harbor Commissioners has approved of the letting of contracts calling for various improvements at the State Grain Terminal located at Islais Creek, aggregating $23,600.

Shipping Platform, Pittsburgh, Pa.—H. H. Heinz Company, 1062 Main street, is having plans prepared by Hunting & Davis, engineers, Century Building, 2 and 3 story, 25 by 500 feet reinforced-concrete and steel shipping platform, Progress street. $175,000.

Grain Elevator, Vancouver, B. C.—Harbor commissioners, 712 Pender street, West, awarded the contract for a super-structure and foundation for Elevator No. 2, reinforced concrete, to Northern Construction Company, 736 Granville street, $1,450,000 and $150,000 respectively.

Levee, Clarksdale, Miss.—The Board of Levee Commissioners, Yazoo Mississippi Delta, received sealed proposals on August 14 for enlarging 5-mile Ward Lake Levee containing 10,000 cubic yards of topping and 75,000 cubic yards of banquette enlargement. W. L. Head, chief engineer.

Coal Elevator, South Beloit (Beloit, Wis., P. O.), Ill.—Keeler Lumber and Fuel Company, 108 State street, Beloit, Wis., awarded the contract for a 60 by 100-foot reinforced-concrete and timber coal elevator, 36 feet high, here, to J. Cliff, Bluff street, Beloit, Wis. Engineer's estimate, $30,000.

Canal Drainage, Senatobia, Miss.—Strahorn Creek Drainage District, Tate County, has awarded the contract for 12½ miles drainage of canals, including 410,680 cubic yards in main canal and 110,000 cubic yard laterals, to Canal Construction Company, McCall street, Memphis, Tenn., at a price of $0.975 per cubic yard.

Contract Awarded, Vicksburg, Miss.—The contract for 4,200 lineal feet of sea wall containing 9,500 cubic yards of concrete, 450 tons of reinforcing steel, 4,200 feet of interlock sheet piling 10-20 feet long, has been awarded to Jefferson Construction Company, Q & C Block, New Orleans, La. Engineer's estimate, $325,000.

Bulkhead, Indian River City, Fla.—Indian River City Town Site Corporation is having plans prepared for a 3,000-foot bulkhead, 400 feet out from meander line of Indian River, and a 600-foot causeway to connect with artificial island of about 5 acres, $150,000. H. F. Williams, care Hotel Pines, Titusville, manager.

Harbor Improvements, etc., Ontario, Can.—The Department of Public Works, Parliament Buildings, Ottawa, plans harbor improvements at Port Stanley, $50,000; Toronto, $600,000; Fort Williams, $192,000; wharf extensions at Pelee Island, $31,000; wharf repairs at Windsor, $3,500; Port Burwell, $2,500. K. M. Cameron, acting chief engineer.

Dredging, New Jersey.—Sealed proposals were received on August 15 at the office of the Department of Commerce & Navigation, Trenton, for dredging a section of proposed inland waterway connecting Barnegat Bay with Manasquan River, Ocean County, at $55,000. H. J. Sherman, engineer. V. Gelineau, State House, Trenton, director.

Dredging, Boston, Mass.—The United States engineer office received bids on August 30 for dredging in Beverly Harbor, Mass. The total estimated quantity of material necessary to be removed, exclusive of allowable overdepth, is 512,803 cubic yards; the maximum amount of allowable overdepth being estimated at 96,940 cubic yards.

Bonds for State Port, Georgia.—A bill providing for the issuance of $15,000,000 in bonds for the creation of a state port at some point to be voted on by the people of Georgia was introduced in the

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house of representatives recently. The bill provides for a vote of the people on the issuance of the bonds and also an election as to the best location for the port.

Port Surveys.—A survey of the ports of this country is being made jointly by the Shipping Board and the Board of Engineers. At present a complete survey of the Port of Norfolk and its terminal facilities is being made by Oliver Albert Reynolds, examiner of ports and terminals for the United States Shipping Board and the United States Board of Engineers for rivers and harbors.

Steel Structure, New Orleans, La.—The Board of Commissioners at the Port of New Orleans received sealed proposals at Suite 200, New Orleans Court Building, on August 16, for furnishing and erecting a steel structure complete for a straw warehouse at the Desire Street landing. Bids were taken separately for fill, concrete floor, etc., and for the structure above the foundations and for the entire work. Requisition E. D.—13752.

Terminal Enlargement, Norfolk, Va.—The Norfolk City Port Commission has been discussing the necessity for taking up the plans for the construction of the proposed west gallery on the municipal grain elevator, in order to handle the business which is now moving through these terminals. The east gallery is now being built by A. M. Crain & Company, the builders of the elevator. The plans and specifications for the west gallery have been drawn, and the work is estimated to cost in the neighborhood of $175,000. The commission also has discussed the possibility of being compelled in a short time to erect an additional storage unit of from 500,000 to 1,000,000 bushels capacity.

GOVERNMENT WORK

Dredging, Galveston, Tex. U. S. Engineer, Galveston, plans dredging in Houston Ship Channel. L. M. Adams, district engineer.

Dredges, Louisville, Ky.—U. S. Engineer, P. O. Box 72, will soon take bids for two steel hull dipper dredges 2½ to 4 cubic yards capacity.

Dredging, San Diego, Cal.—Specification 4885. The Bureau of Yards and Docks, Navy Department, Washington, D. C., plans dredging here.

Dredging, Norwalk, Conn.—Sealed proposals were received at the office of the U. S. Engineer, Providence, R. I., on August 22 for dredging in Norwalk Harbor.

Lock Construction, Pittsburgh, Pa.—The U. S. Engineer Office, Pittsburgh, received sealed proposals on August 23 for constructing new Lock No. 7, Monongahela River.

Dredging, Milwaukee, Wis.—Contract for dredging various rivers and channels during the season have been awarded to Great Lakes Dredging & Dock Company, 216 West Water street, $0.364 per cubic yard, total $31,500.

Dredging, New York, N. Y.—U. S. Engineer Office, 2nd District, Army Building, awarded the contract for removing St. George Shoal, New York and New Jersey Channels, to G. H. Breyman & Brothers, 17 Battery place, at $7,200.

Stone Riprap, Harbor Beach, Mich.—Sealed proposals were received at the United States Engineer Office, Detroit, Mich., on August 16 for furnishing and placing, and for recovering and replacing stone riprap at Harbor Beach, Mich.

Dredging, Etc., Buffalo, N. Y.—Bids will be asked for in a short time by the U. S. Engineer Office, Federal Building, Buffalo, for dredging and rock excavation in the Black Rock Canal, Buffalo, approximate cost to be $250,000.

Pumps, New Orleans, La.—The contract for furnishing two 20-inch dredge pumps to U. S. Engineer Office, 329 Custom House, has been awarded to Ellicott Machine Corporation, Bush and Severn streets, Baltimore, Md. $11,200.

Tanks, Memphis, Tenn.—U. S. Engineer Office, Mississippi River Dredging District, P. O. Box 1017, awarded the contract for two 20,000-barrel fuel oil tanks, at U. S. Dredge Depot, here, to Walsh & Weidner Boiler Company, Main and Sycamore streets, Chattanooga, $26,404.

Contract Awarded, Louisville, Ky.—U. S. Engineer Office, P. O. Box 72, awarded the contract for a deep well centrifugal pump, double stroke, 8-inch drop pipe, for Dam 44, to Belknap Hardware & Manufacturing Company, 2nd and Washington streets. $2,230.

Lumber, Louisville, Ky.—The contract for furnishing yellow pine No. 1 common, 1,300 pieces, 6 by 8 inches by 20 feet; 250 pieces 4 by 6 inches by 20 feet, 120 pieces 2 by 4 inches by 10 feet, etc., to U. S. Engineer Office, Louisville, has been awarded to King Sparrow Lumber Company, Hattiesburg, Miss. $32 per M feet.

Grain Elevator, Montreal, Que.—Montreal Harbor Commissioners will build Tarte Pier grain elevator by day labor. First unit 2,000,000-bushel capacity reinforced-concrete, structural steel marine towers, track sheds, receiving house and shipping houses, $2,347,000. J. S. Metcalfe Company, Ltd., 54 St. Francois Xavier street, architects.

Repairs, Philadelphia, Pa.—Sealed proposals were received on August 28 by J. M. Hoffman, Division of Docks and Wharves, Navy Building, Washington, D. C., for repairs to substructure and deck of portions of Piers 97, 98 and 99, Philadelphia Army Supply Base, foot of Oregon avenue, Philadelphia, for the United States Shipping Board.

Steel Booms, Pilcher, Ky.—Sealed proposals were received by the United States Engineer Office, Room 423, Customhouse, Louisville, Ky., on August 27, for furnishing and delivering two steel booms, 67 feet long complete with 22-inch sheaves, etc., delivery to be c/o U. S. Government Engineer, c/o Dam 44, Ohio River, U. S. Siding, Pilcher, Ky., a station on the L. H. and St. L. R. R.

NEW INCORPORATIONS

The Callaghan Transportation Corporation, capital $100,000, chartered under Delaware laws.

The Bison Steamship Corporation, of Tonawanda, N. Y., capital $150,000, chartered at Albany. Incorporators: J. J. and M. O'Hagan and J. Gehm.

The Morecraft Transportation Corporation, of Wilmington, Del., capital $500,000, incorporated under Delaware laws, to engage in the operation of boats.

The Pacific Mail Corporation, capital $1,000,000, incorporated under Delaware laws. Incorporators: F. M. Stokes, of Woodhaven, L. I.; Joseph F. Mann, of Bloomfield, N. J., and William D. Ahearn, of Brooklyn.

MARINE SOCIETIES

AMERICA

American Society of Naval Engineers
Navy Department, Washington, D. C.
Secretary-Treasurer—Commander S. M. Robinson, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

Society of Naval Architects and Marine Engineers
29 West 39th Street, New York
Secretary and Treasurer—Daniel H. Cox.

National Association of Engine and Boat Manufacturers
29 West 39th Street, New York City
Secretary—R. R. A. Hand.

United States Naval Institute
Naval Academy, Annapolis, Md.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

American Marine Association
15 Park Row, New York
President—E. A. Simmons.
Secretary—K. W. Heinrich.

The New York Tow Boat Exchange
11 Moore St., New York.
Secretary—Irving G. Keller.

Port of New York Authority
11 Broadway, New York
Chairman—E. H. Outerbridge.
Secretary—William Leary.

Marine Engineers' Supply Men's Association
Room 507, 30 Church Street, New York.
Secretary—Robert P. Jones.

National Association of Masters, Mates and Pilots
National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

American Society of Marine Designers
Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

National Marine Engineers' Beneficial Association
Headquarters 311-315 Machinists Building, Washington, D. C.
Secretary-Treasurer—George A. Grubb.

Atlantic Coast Shipbuilders' Association
1600 Walnut Street, Philadelphia, Pa.
Secretary—C. S. King.

American Steamship Owners' Association
11 Broadway, New York
President—A. G. Smith.
Vice-President and General Manager—Winthrop L. Marvin.

United States Ship Operators' Association
149 Broadway, New York
President—C. H. Potter.

National Merchant Marine Association
Munsey Bldg., Washington, D. C.
President—Hon. J. E. Ransdell.

The Maritime Association of the Port of New York
78 Broad St., New York City
President—Charles H. Potter.
Secretary—Walter F. Firth.

Lake Carriers' Association
Detroit, Mich.
Secretary—George A. Marr.

Neptune Association
21 Pearl St., New York City
Secretary-Treasurer—Captain John F. Milliken.

Ocean Association of Marine Engineers
15 Whitehall St., New York City
Secretary—Bert L. Todd.

CANADA

Grand Council N. A. of M. E. of Canada
Grand Secretary-Treasurer—Neil J. Morrison, Box 886, St. John, N. B.

GREAT BRITAIN

Institution of Naval Architects
5 Adelphi Terrace, London, W. C.

Institution of Engineers and Shipbuilders in Scotland
39 Elmbank Crescent, Glasgow.

Northeast Coast Institution of Engineers and Shipbuilders
Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

Institute of Marine Engineers, Incorporated
The Minories, Tower Hill, London.

ITALY

Collegio Degli Ingegneri Naval e Meccanici in Italia

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